May 1982

MICROCOMPUTING

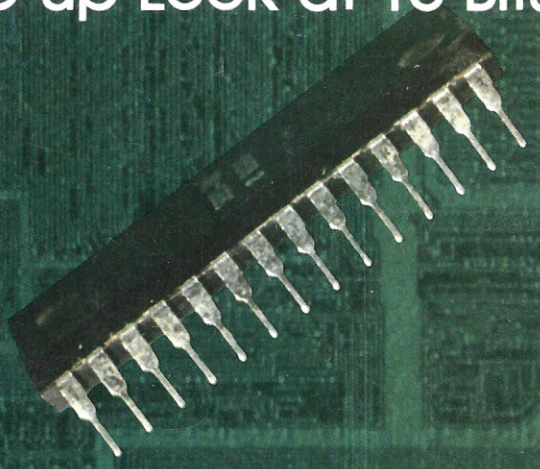
T.M.

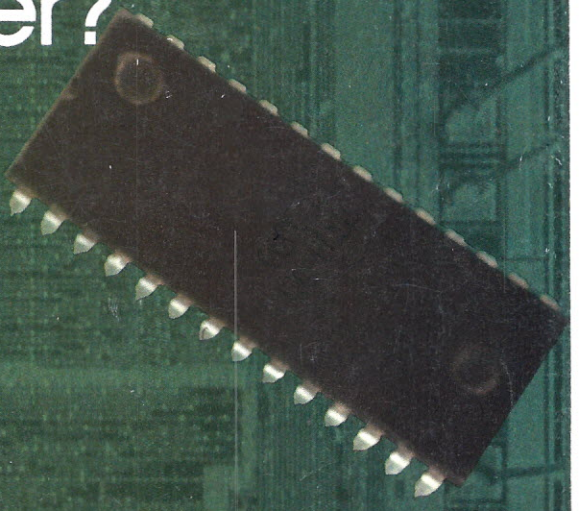
A WAYNE GREEN PUBLICATION

USA $2.95 (UK£1.80)

Is Bigger Really Better?

A Close-up Look at 16 Bits





Crush Those Devastating Power Spikes!

ring Sinclair's Tiny World

val Kit for Printer Buyers

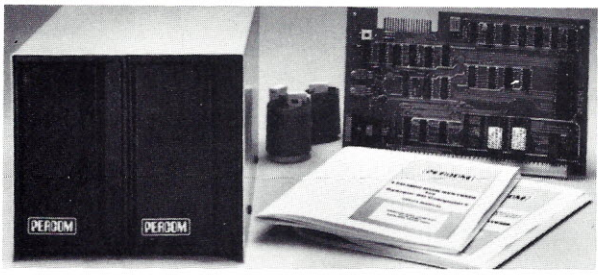
WEST CHESTER PA 19380

05

74470 65945

From Percom...
System-50 Summer Save-On Sale!

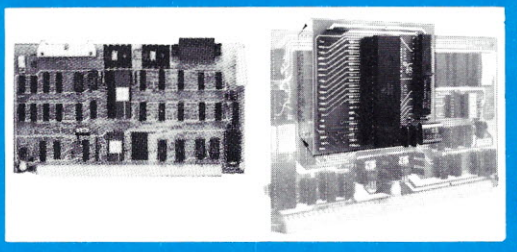
Save On LFD First-Drive Systems – Proven clock-data separation circuitry and other superior design features • Reliable hard-sector diskette formatting • Stores up to 102 Kbytes of formatted data on 40 tracks • Complete with drive (or drives), S-50 4-drive controller, MPX or MPX/9 DOS, interconnecting cable and users manual. While they last...



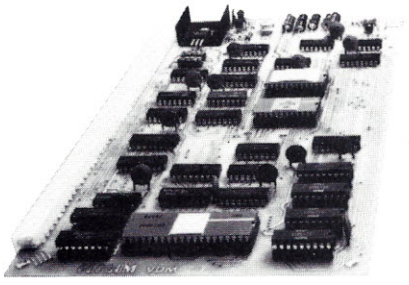
40-Track, one-drive, non-flippy	now $384.95	**Save $ 75**
40-Track, one-drive, flippy	now $399.95	**Save $100**
80-Track, one-drive, non-flippy	now $520.95	**Save $100**
80-Track, one-drive, flippy	now $560.95	**Save $100**
LFD 4-Drive Controller (only)	now $ 95.00	**Save $ 20**
2-Drive Interconnecting Cable (only)	now $ 19.95	**Save $ 10**
3-Drive Interconnecting Cable (only)	now $ 29.95	**Save $ 5**

First-Drive Systems are also available in 2- and 3-drive versions. Save even more!

Save On Single-Board Computer/S-50 MPU Card now $119.95 **Save $20** The SBC/9 is a computer or a fully compatible SS-50 bus MPU card • Interchangeable 6802 or 6809 processor • Extendable 1-Kbyte ROM monitor • Parallel and serial I/O ports – selectable, full-range bit rate generator for serial I/O • Extendable addressing • On-card 1-Kbyte RAM • Provision for additional EPROM • On-card voltage regulator circuits.



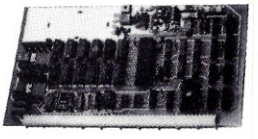
Save On 6809 MPU Upgrade Adapter now $31.95 **Save $8** Upgrades 6800 MPU cards to 6809 processing power. Configured for SWTP MP-A2 MPU card but may be used with other MPUs. Plug-in installation requires no trace cutting or soldering – easy to restore MPU to original configuration. Assembled and tested. Includes user instructions. 6809 ROM operating system, PSYMON/A2, for use with the 6809 MPU Adapter – $69.95.



Save On Memory-Mapped Video Display Generator Controllers...

The **Electric Window** features software-defined display formats, expandable 128-unit character generator, fully formed characters, composite or separate sync-video output. now $119.95. **Save $50.**

The **ColoRAMa-50** features up to 8-color displays and 256 × 192 pixel resolution (with full display RAM), extended 1-Mbyte addressing capability, provision for audio cassette I/O and low cost rf modulator for TV displays, comprehensive manual with 6809 driver listing. Now $94.95 with 1K display RAM. **Save $45.** Additional display RAM $19.95/Kbyte. **Save $10.**



Save On Dual Serial I/O Card now $54.95. **Save $20.** This two-channel RS-232 data communications interface features an on-card bit-rate generator (BRG) (ideal for extended addressing bus) that generates seven standard rates from 110 b/s to 19,200 b/s, individually selectable TX/RX rates for each channel, compatibility with older and newer versions of 30 pin I/O bus and either 16- or 4-byte boundary addressing. Note: Shown with optional port connectors, configuration switches and BRG installed. Also available without BRG for $49.95. **Save $10.**

Save On Rock Solid RAM Cards now $94.95. **Save $45.** Includes 8K of RAM, expandable to 24K. Each 8K block may be located at any 8-Kbyte boundary of 64K address space. Other features: 1-Mbyte extended addressing, buffered data, address and control lines, comprehensive manual with diagnostic memory test programs.
Eight-Kbyte RAM kit – now $49.95. **Save $40.**

Versatile Prototyping Boards, Extendable Motherboards

50-pin Motherboard/Extender Board (7-slot)	$21.95
I/O Motherboard Kit (8-slot)	$44.95
S-50 Bus Protoboard	$24.95
I/O Bus Protoboard	$14.95

ColoRAMa-50, Electric Window, SBC/9, PSYMON and PERCOM are trademarks of Percom Data Company, Inc.

PRICES & SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

As near as your telephone – You can save on the lowest prices ever for these quality Percom products by calling **toll-free 1-800-527-1222** (from in Texas call 214/340-7081). Don't wait! At these prices we cannot guarantee product inventories.

PERCOM
PERCOM DATA COMPANY, INC.
11220 Pagemill Road · Dallas, Texas · 75243
214/340-7081

You, your child or your secretary

can now use your computer and never have to open a book!

One hour of easy listening replaces all the confusing written manuals usually required to begin using your new computer.

When the computer is unpacked and the power is turned on, you are anxious to do more than merely admire the attractiveness of your new computer. You made an investment for a purpose! Why not get the system up and running instantly?

If your application is business, you don't really have a lot of time to study the BIG THICK MANUALS! They are fine for researching more advanced applications. For now you want to realize the benefits of the word and number processing power available at your finger tips!

Buy the Computer you have your heart set upon and let us teach you how to manipulate the operating system. Buy the Word and Number Processing software to let it perform all your important business functions and let us PATIENTLY, INEXPENSIVELY and INSTANTLY get the system down to the business of producing RESULTS!

Sold only through selected dealers

PRICED UNDER $40

These "plain language" condensed user's manuals are available now in standard audio cassette. Many others are being developed and will soon be available...

- ☐ XEROX 820[6]
- ☐ HEATH/ZENITH 89[3]
- ☐ IBM PERSONAL COMPUTER[2]
- ☐ SUPERSORT
- ☐ OSBORNE 1[5]
- ☐ APPLE II[9]
- ☐ ATARI 800[7]
- ☐ dBASE II[4]
- ☐ WORDSTAR 1[8]
- ☐ DATASTAR
- ☐ CALCSTAR
- ☐ CP/M[1]

Trademarks of: 1. Digital Research 2. IBM Corp. 3. Heath Company/Zenith Radio Corp. 4. Ashton Tate 5. Osborne Computer 6. Xerox Corp. 7. Atari 8. Micro Pro International 9. Apple Computer

DEALERS:

Add a CUSTOMER SUPPORT department to your store. Use your time for SELLING not TEACHING! Your customers will have their new computer up and operating the day of purchase! END the USER MANUAL MYSTERY, stock MICRO Instructional tapes!

DEALERS CALL TOLL FREE 800-227-1617, EXT. 425 (IN CALIF: 800-772-3545, EXT. 425)

MICRO INSTRUCTIONAL INC.

6299 W. SUNRISE, FT. LAUDERDALE, FL 33313, (305) 584-3133

MICROCOMPUTING

Contents: May 1982 — Volume VI No. 5

36 Sweet Sixteen–Micros Come of Age Harold Nelson
Learn what 16 bits can mean to you.

40 Survival Kit for Printer Buyers (I) Jim Hansen
This series begins with a review of the Centronics 739.

56 The H-89 Sounds Off Alan Hufnagel — Heath
Add audio output to Heath's All-In-One Computer.

60 Memory Size–Who Needs It? R.S. Lewis — TRS-80
Throw away memory size and type on your TRS-80 typewriter.

64 Information Retrieval–Quick and Dirty Murray Lesser
Index information with a line editor; no special database manager needed.

72 A Shocking Look at Voltage Suppressors G. Michael Vose
Preserve the integrity of your micro's data.

80 Exploring Sinclair's Tiny World Jerry Martin — ZX81
Pocket $50 by assembling the ZX81 yourself.

88 Compress It! David Gustafson — North Star
Improve memory efficiency and execution time on your North Star.

94 Pascal I/O Interfacing Made Easy Marc Stiegler — OSI
Develop an appropriate Pascal mechanism for tone generation on the C8P.

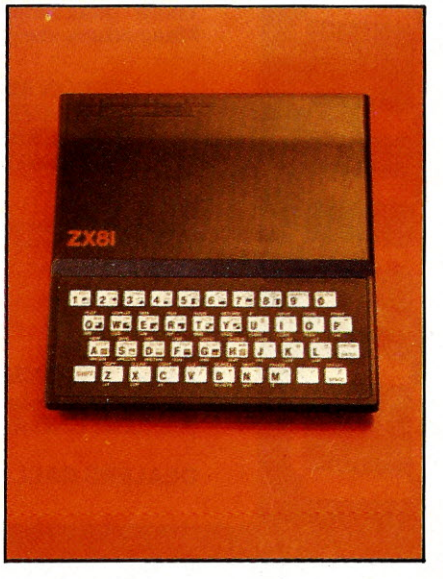
98 Reverse Video for the Sorcerer Dwayne Smith — Sorcerer
It's no hocus-pocus; all you need is this machine-language subroutine.

Publisher's Remarks–6
PET-pourri–12
Micro Quiz–16
Dial-up Directory–18
Computer Blackboard–28
Letters to the Editor–32
New Products–136
New Software–144
Dealer Directory–147
Calendar–148
Clubs–149
Classifieds–149
Software Reviews–162

This month's cover: Photo by Jonathan Nash.

Page 40.

Page 80.



PUBLISHER/EDITOR
Wayne Green

EDITORIAL MANAGER
Jeff DeTray

MANAGING EDITOR
Dennis Brisson

COPY EDITOR
Eric Maloney

TECHNICAL EDITORS
Harold Nelson, G. Michael Vose

EDITORIAL ASSISTANTS
Lise Markus, Linda Stephenson

PRODUCTION EDITOR
Susan Gross

ADMINISTRATIVE ASSISTANT
Michelle Christian

ASSOCIATE EDITORS
Robert Baker, Ken Barbier, Frank Derfler, Jr., Peter Stark

PRODUCTION MANAGER/PUBLICATIONS
Nancy Salmon

ASSISTANT PRODUCTION MANAGER
Michael Murphy

ADVERTISING GRAPHICS
Bruce Hedin, Steve Baldwin, Fiona Davies, Jane Preston

PRODUCTION DEPARTMENT
Joan Ahern, Frances Benton, Linda Drew, Bob Dukette, Matthew Hale, Susan Hays, Theresa Ostebo, Scott Philbrick, Dianne Ritson, Mary Seaver, Betty Smith, Deborah Stone, Anne Vadeboncoeur, Irene Vail, Judi Wimberly, David Wozmak

PHOTOGRAPHY
Thomas Villeneuve, Sandra Dukette, Bryan Hastings, John Schweigert, Robert Villeneuve

TYPESETTING
Sara Bedell, Melody Bedell, Debbie Davidson, Michele DesRochers, Anne Rocchio, Ellen Schwartz, Kelly Smith, Lisa Steiner, Karen Stewart

DESIGN CONSULTANTS
Denzel Dyer, Howard Happ, Laurie MacMillan, Joyce Pillarella, Diana Shonk, Susan Stevens, Donna Wohlfarth

EXECUTIVE VICE-PRESIDENT
Sherry Smythe

GENERAL MANAGER
Debra Boudrieau

COMPTROLLER
Peter Correia

EXECUTIVE ASSISTANT
Leatrice O'Neil

ACCOUNTING MANAGER
Knud Keller

CIRCULATION
Doris Day, Pauline Johnstone

BULK SALES MANAGER
Ginnie Boudrieau

ADVERTISING
603-924-7138
Louise Caron, John Gancarz, Susan Martin, Hal Stephens
Marcia Stone, Office Mgr.

NEW ENGLAND ADVERTISING REPRESENTATIVE
John A. Garland
Jack Gardner
Garland Associates, Inc.
Box 314 SHS
Duxbury, MA 02332
617-934-6464 or 6546

Microcomputing (ISSN 0192-4575) is published monthly by Wayne Green, Inc., 80 Pine St., Peterborough NH 03458. Subscription rates in U.S. are $25 for one year and $53 for three years. In Canada: $27 for one year only, U.S. funds. Foreign subscriptions (surface mail)—$35 for one year only, U.S. funds. Foreign air mail subscriptions—please inquire. Canadian Distributor: Micron Distributing, 409 Queen St. West, Toronto, Ontario, Canada M5V 2A5. South African Distributor: Microcomputing, PO Box 782815, Sandton, South Africa 2146. Second-class postage paid at Peterborough, NH 03458 and at additional mailing offices. Phone: 603-924-9471.

Entire contents copyright 1982 by Wayne Green, Inc. No part of this publication may be reprinted or otherwise reproduced without written permission from the publisher.

Postmaster: Send form #3579 to *Microcomputing*, Subscription Services, PO Box 997, Farmingdale, NY 11737.

OKIDATA

Making small printers for people who think big.

53

OKIGRAPH™ Dot Addressable Graphics Prints Circles Around The Competition

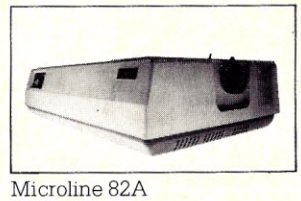
Or squares. Or charts. Or graphs. Or illustrations. Or any graphic data your computer tells it to print. All with superb clarity and resolution.

OKIGRAPH™ is standard equipment on the Microline 84 and the Model 2350. It's an easily added option to the Microline 82A and 83A. So don't settle for the plain old text you get with other printers. Be creative. With Okigraph.

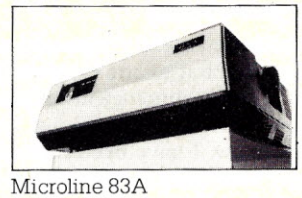
Interested? Contact us at 111 Gaither Drive, Mount Laurel, N.J. 08054, or call (800) 257-7768 for the name of your local authorized Okidata distributor.

Okidata is a subsidiary of
Oki Electric Industry Company Ltd.

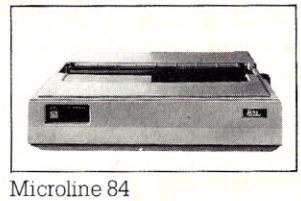
- OKIGRAPH™ I includes two plug-in PROMs and an instruction manual on Assembly language programming.
- OKIGRAPH™ II includes a floppy disk for additional graphics printing features and an instruction manual.



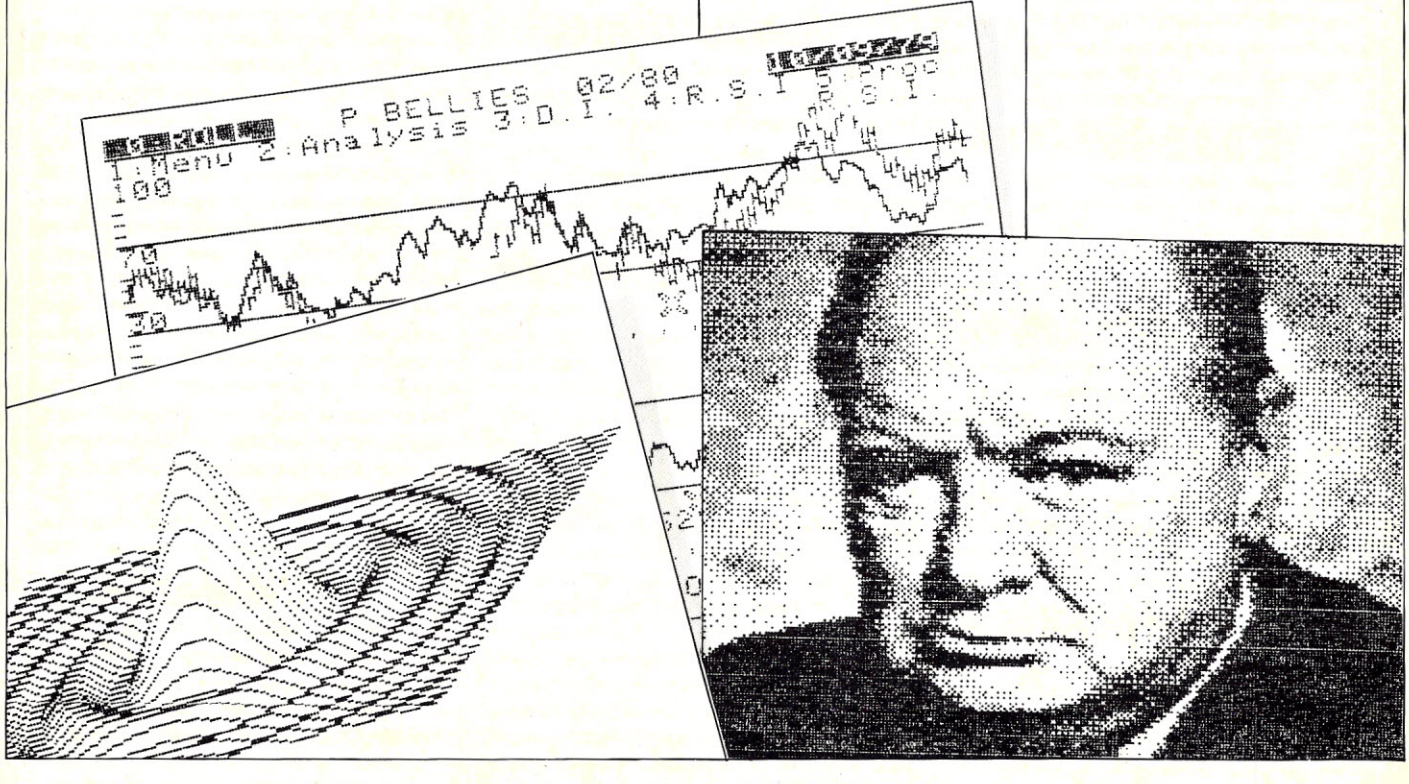
Microline 82A



Microline 83A



Microline 84



See List of Advertisers on page 130

By Wayne Green

Setting Type With Micros

Typesetting

A reader recently protested something I had written about typesetting unions opposing technological improvements. Having been in publishing for over 30 years now, I have been more than passingly interested in typesetting, and have kept up to date on it.

Up until about 15 years ago almost all type was set by the printing firms using the Mergenthaler Linotype machine. The typesetters union was a very powerful one. When I started my first big magazine, *73*, back in 1960, it was printed by O'Brien Press in New York. This was once the largest publication printer in the country. When I started working with them I found them saddled with a large number of 40-year veterans of typesetting. You had to be the son of a union member to join, they claimed, and also pay an incredible initiation fee (like $25,000, which was a lot of money in 1960).

This group was dedicated to featherbedding and made work with a diligence that was hard to believe. They would fight to the death against anything which would take away a job. They spent days rekeyboarding material as called for in their union rules.

Whenever a newspaper wanted to try out any automated typesetting systems such as punched tape for the Linotype or Varityper systems, the matter quickly came to strike proportions—supported by the other printing trade unions. Not only did the strength of these unions keep technology at bay for years, their insistence on maintaining low productivity forced more and more publishers out of business.

This intransigence cost printers the whole typesetting market. As I said, it wasn't long ago that virtually all type was being set by printers. The Varityper broke the ice. But it wasn't a very good piece of equipment, so it didn't make much of an impact. The big change was when IBM came out with their Composer.

> Today there are few publishers who don't set their own type, and few printers who do much typesetting.

Since the unions didn't allow printers to install the IBM Composers, publishers, faced with the age-old costs and slowness of Linotype, quickly picked up on the IBM system as a way to cut typesetting costs substantially. Also, doing the work in-house sped it up, making last-minute changes much simpler and less expensive.

For the first few years of *73* we had all of our type set in lead with the Linotype systems. Then, when an issue of the magazine was about ready to go to press, someone from our offices (often it was I) would have to drive to the printing plant and work for a couple of days to correct errors and get the magazine ready for printing.

We were one of the early magazines to change to the IBM system, starting out around 1967 with a Composer to type each line of type twice—once to determine its length and the second to make it a uniform length based upon the first measurement. A few years later this process was done automatically and we changed to the new Composer.

Today there are few publishers who don't set their own type—and few printers who do much in the way of typesetting. The unions killed a very big industry for the printers. It isn't as efficient for most publishers to use this in-house typesetting, but there isn't a lot of choice today. So many publishers do typesetting that there is only a relatively small market for contract typesetting, and thus the costs are relatively high. We find that we can set type at about half the cost of having it done outside.

Microcomputers Help

Most of the better typesetting systems today have an interface for accepting input from microcomputers. An increasing amount of the keyboarding for our publications is brought in on disk from the authors. Other material is written by editors on TRS-80 systems and fed directly to the typesetting system. In another year we expect at least 75 percent of our keyboarding of magazine material to come in on disk, on cassette or over phone lines. This material will then be edited on microcomputers and then fed into the typesetting system.

We are evaluating new typesetting systems. We started with a Compugraphic typesetter a few years ago when IBM failed to keep up with technology and their Composer systems were no longer competitive. Then, as we grew, we kept adding more Compugraphic systems.

Last year, after having massive problems keeping up with our typesetting needs, we studied the situation and found that we had fallen behind again. We were experiencing catastrophic failures of the Compugraphic systems, with four out of five of them being down at times. We found that the cost of repairs was more than the cost of the equipment, by a rather wide margin. We found our magazines being delayed by the breakdowns in the Compugraphics, with a resulting loss of advertising attributable to that situation on the order of $3M or more. You know, a few million here, a few million there, and soon you are talking about real money.

With our publishing venture growing at about 50 percent per year, it has been a constant problem trying to keep up with facilities and people. We've expanded from one very old house to six buildings for work plus a couple more for storage. The graphic arts department has been expanded and modernized, with three

Reader Service for facing page ↙65→

FDC-I SBC-I SYSTEMASTER®

The Next Logical Step

Teletek FDC-I, The First Step
A CPU, floppy disc controller and I/O all on one board. Until SYSTEMASTER® the most powerful IEEE-S-100 board on the market.

Teletek SBC-I, The Second Step
A board designed for use in high performance, multi-processing systems. SBC-I combines its own CPU, serial and parallel ports, 128K of segmented memory and FIFO.

SYSTEMASTER®, The Next Logical Step
Teletek's newest product — a breakthrough in S-100 board design. SYSTEMASTER® is a complete system. No other boards are required. It doesn't even require a bus!

But, when used with an S-100 bus, SYSTEMASTER® has even more capabilities. You can readily expand to multi-user or multi-processor systems using SYSTEMASTER® as the master board.

SYSTEMASTER® Features:

- CPU: 4MHz Z80A
- Floppy controller: controls mini and/or maxi drives; variable independently-adjustable pre-write compensation.
- Two RS-232C ports.
- Two full parallel ports.
- 64K bank-selectable memory variable from 32K to 60K. Remaining memory is fixed at top of 64K address space.
- Multiplexed DMA: allows transparent data transfer to floppy disks and other devices without CPU wait states.
- Relocatable EPROM/ROM/PROM: 2K, 4K or 8K with deselect capability.
- Real-time clock.
- Operating systems available: Digital Research or Infosoft.
- Parallel ports may be connected to Teletek's PSC board for RS-422 capability.

TELETEK

✓65

9767F Business Park Drive Sacramento, CA 95827 (916) 361•1777

© Teletek 1982

large darkrooms and automatic film processing.

With many of the other publishers collapsing around me, I guess I have nothing to complain about. *Byte* had to sell out. *Creative* had to sell out. *Personal* had to sell out. *Interface* seems to be having insurmountable troubles. Golly, I'm the *only* one still around.

Those Confounded Arcade Games

There has been an increasing uproar over the way arcade games have been addicting our kids. The quarters pour into the games, making the arcade owners, the owners of the games and the manufacturers rich.

Having been addicted to computer games myself, I can understand the psychology involved. That's a dark side of my past that I have heretofore kept secret. But to provide myself as an example of what can happen—and to prove that total reformation is possible—I offer myself for inspection.

Perhaps I can throw myself on your mercy in this, pleading extreme youth. Others will unkindly point out that there is little proof that I am not still suffering from extreme youth. Well, some of us mature late. Perhaps this year (60) will be a winner and I will grow up. I hope not.

It all started while I was in the Navy back in 1943. I was going to school at Treasure Island in San Francisco, taking a crash course in electronics and radar repair. Not permitted off the island except on weekends, I found myself with time to kill in the evenings and soon gravitated to the arcade games at the ship's service building, which featured particularly fiendish hockey games for a nickel.

I have a sense of competitiveness that gets me into trouble all the time. All it took was for someone to start playing on one of the hockey games and formerly tightwad Green would jump to the other machine to try and beat him out. It wasn't long before I could rack up a perfect score every time. Then I started running both machines at once and worked at it until I could get perfect scores on both simultaneously.

Now, where does an enterprising youth go from there? I started working 'em behind my back, going by the sound of the balls hitting to know when to have which hockey player swing. In a couple of weeks I could run both at once behind my back and get perfect scores. There was no more competition by this time, just performances and applause. I retired and took up poker.

I thought I had managed to kick the habit, but when the first of the electronic games came along my recidivist tendencies dragged me back into the arcades. It was those tank games that got me. I was innocently walking along the boardwalk at Atlantic City, resting between sessions at the first Computer show in 1976. A tank game pusher grabbed my arm and asked me just to try it . . . and that was it. I was throwing quarters into the machine as fast as I could, jumping around with glee as I shot all my opponents apart.

Reason—and a passionate love of quarters—prevailed, and I have managed to steer clear of those dens of iniquity since then.

Well, I wanted to share this part of my checkered past with you in the hopes that any addictees to arcade games will take heart and try to kick the habit. It *can* be done.

Program Protection

The technological war between program publishers and program stealers is warming up, I like the recent idea of selling a program with a demonstration disk as an addition. If the buyer likes the demo all he has to do is go back to the store, pay the remainder of the program price and receive a key to unlock the program itself.

The store thus has a smaller investment in the program before the sale, enabling the store to keep a larger inventory of programs on hand. When the customer comes in and pays the remaining part of the program price, the store calls the publisher and gets the specific key for that particular disk over the phone, allowing it to be used.

We'll be seeing more of these creative protection systems, I'm sure.

A couple of publishers are experimenting with a protection system that causes the computer to blow itself up if an illegal copy of the program is attempted. There is some question of legal liability in this instance which has been slowing down the use of the idea.

If a user buys a program that clearly states—on the program package, in the documentation and on the disk—that attempting to copy the program can destroy the computer, one wonders if this is enough warning to protect the publisher. It would be possible to also include a routine that warns the program user on the screen that if ordinary copy methods are attempted, further fooling around can cause the computer to self-destruct. Thus there would be no question about accidental damage to the system.

Since this is a situation without precedent, the usual advice from lawyers is not to try it. How about it, lawyers?

Control Keys

One of the major differences between microcomputers used for word processing and computer systems which are made specially for WP application is an extra row of keys for special functions.

Micros generally have most of the same functions, but you have to access them by touching two keys at the same time. That slows things down.

If you think about this for a short while (doesn't take long), you'll realize that when you are using the word processing function of your computer it is highly unlikely that you will have to use the ten-digit keypad at the same time. Voila! Ten to 12 special function keys sitting right there, ready for use.

In some systems these keys can be changed in their function by software, but with most systems it is going to take a slight hardware modification. This is an excellent business opportunity for a small company to package conversion kits with new keys to put on the switches which will show the functions as well as the numbers. In this way you can use the keypad when the computer is being used for numerical input, but can switch to the word processor function when the keys are needed for that.

Conversions should be possible for most computer stores to install once the parts kit, instructions and software are available from some firm. That's a lot easier solution to the problem than either making do with the escape functions or adding a separate keypad.

Well, there's your new business of the month . . . get going.□

Happy Hands

Offers Discounts on All

TRS-80™ COMPUTERS

We Have What You Are Looking For

- ☐ PROMPT SHIPPING
- ☐ AVAILABLE SERVICE CONTRACTS
- ☐ DISCOUNTED PRICES COMPARABLE TO ANY OTHERS
- ☐ NO TAX ON OUT OF STATE SHIPMENTS

Call Collect For Prices
And Shipping Schedules

505-257-7865

or write

HAPPY HANDS ↵243
P.O. DRAWER I
RUIDOSO, NEW MEXICO
88345

Most small system users think all micro-omputers are created equal. And they're ght. If you want performance, convenience, tyling, high technology and reliability (and 'ho doesn't?) your micro usually has a price ag that looks more like a mini. It seems big erformance always means big bucks. But ot so with the SuperBrain!

Standard SuperBrain features include: twin ouble-density 5¼" drives which boast nearly 50,000 bytes of disk storage — expandable o 10 megabytes. A full 64K of dynamic AM. A CP/M* Disk Operating System to nsure compatibility to literally hundreds of pplication packages presently available. And, 12" non-glare, 24 line by 80 column screen.

You'll also get a full ASCII keyboard with an 18 key numeric pad and individual cursor control keys. Twin RS232C serial ports for fast and easy connection to a modem or printer. Dual Z80 processors which operate at 4 MHZ to insure lightning-fast program execution. And the list goes on! Feature after feature after feature.

Better yet, the SuperBrain boasts modular design to make servicing a snap. A common screwdriver is about the only service tool you'll ever need. And with the money you'll save on purchasing and maintaining the SuperBrain, you could almost buy another one. For under $3,500, it is truly one of the most remarkable microcomputers available anywhere.

Whether your application is small business, scientific, educational or just word processing, the SuperBrain is certainly an exciting solution to the small computer problem. And since you can easily expand it, you'll probably never outgrow it.

Call or write us today for a complimentary copy of our "SuperBrain Buyer's Guide." We'll show you how you can get big system performance without having to spend big bucks.

INTERTEC DATA SYSTEMS®
2300 Broad River Rd. Columbia, SC 29210
(803) 798-9100 TWX: 810-666-2115

✓3

egistered trademark of Digital Research, Inc.

SUPERBRAIN™

The $149.95 personal computer.

Introducing the Sinclair ZX81

If you're ever going to buy a personal computer, now is the time to do it.

The new Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only $149.95* completely assembled.

Don't let the price fool you. The ZX81 has just about everything you could ask for in a personal computer.

A breakthrough in personal computers

The ZX81 is a major advance over the original Sinclair ZX80—the world's largest selling personal computer and the first for under $200.

In fact, the ZX81's new 8K Extended BASIC offers features found only on computers costing two or three times as much.

Just look at what you get:

- Continuous display, including moving graphics
- Multi-dimensional string and numerical arrays
- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function useful for both games and serious applications
- Built-in interface for ZX Printer
- 1K of memory expandable to 16K

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. And you can use a regular cassette recorder to store and recall programs by name.

*Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.

If you already own a ZX80

The 8K Extended BASIC chip used in the ZX81 is available as a plug-in replacement for your ZX80 for only $39.95, plus shipping and handling—complete with new keyboard overlay and the ZX81 manual.

So in just a few minutes, with no special skills or tools required, you can upgrade your ZX80 to have all the powerful features of the ZX81. (You'll have everything except continuous display, but you can still use the PAUSE and SCROLL commands to get moving graphics.)

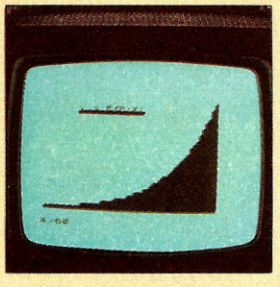
With the 8K BASIC chip, your ZX80 will also be equipped to use the ZX Printer and Sinclair software.

Order at no risk**

We'll give you 10 days to try out the ZX81. If you're not completely satisfied, just return it to Sinclair Research and we'll give you a full refund.

And if you have a problem with your ZX81, send it to Sinclair Research within 90 days and we'll repair or replace it at no charge.

**Does not apply to ZX81 kits.



NEW SOFTWARE: Sinclair has published pre-recorded programs on cassettes for your ZX81, or ZX80 with 8K BASIC. We're constantly coming out with new programs, so we'll send you our latest software catalog with your computer.

ZX PRINTER: The Sinclair ZX Printer will work with your ZX81, or ZX80 with 8K BASIC. It will be available in the near future and will cost less than $100.

16K MEMORY MODULE: Like any powerful, full fledged computer, the ZX81 is expandable. Sinclair's 16K memory module plugs right onto the back of your ZX81 (or ZX80, with or without 8K BASIC). Cost is $99.95, plus shipping and handling.

ZX81 MANUAL: The ZX81 comes with a comprehensive 164-page programming guide and operating manual designed for both beginners and experienced computer users. A $10.95 value, it's yours free with the ZX81.

CRT CONTROLLER

This intelligent CRT Controller uses an 8085A CPU & an 8275 Integrated CRT Controller. it features:

- 25 lines (80 char./line)
- 5x7 dot matrix
- Upper & lower case
- Two 2716's (controller & char. generator)
- Serial interface RS232 & TTL
- Baud rates of 110, 150, 300, 600, 1200, 2400, 4800 and 9600
- Keyboard scanning system
- Unencoded keyboard required
- Uses + 5V & ± 12V Power Supplies
- Does not have graphic capabilities.

Documentation includes program listing and composite video circuit.

Bare Board only (with doc)	**$39.95**
2716 Char. Gen. A 7	**$19.95**
2716 Program A 12	**$19.95**

A-D CONVERTER

JBEs 16 channel A-D Converter plugs into your Apple II computer. It uses an ADC0817 which incorporates a 16 channel multiplexer and an 8 bit A-D Converter. The 16 inputs are high impedance and the voltage range is 0 to 5.12 volts. Conversion time is <100 µsec. The resolution is 8 bits or 256 steps, linearity is ± 1/2 step. Two 16 pin DIP sockets are used for input, GND & reference voltage connections. There are 3 single bit TTL inputs. Doc. Includes sample program.

81-132A Assm.	**$89.95**
81-132K Kit	**$69.95**
81-132B Bare Board	**$29.95**

EPROM PROGRAMMER

JBE's EPROM Programmer is designed to program 5V 2516's, 2532's & 2716's. It interfaces to the JBE Parallel I/O card using four ribbon cables. An LED indicates when the EPROM is being programmed. A textool zero insertion force socket is used for the EPROM. Comes with complete documentation for writing and reading EPROM's in the Apple II or Apple II Plus. Cables available separately.

80-244A Assm.	**$49.95**
80-244K Kit	**$39.95**
80-244B Bare Board	**$24.95**

PARTS

6502 MPU	**$9.95**
6522 VIA	**$9.95**
Z-80 MPU	**$9.95**
Z-80 PIO	**$9.95**
TWO 2114 RAM	**$9.95**
2716	**$14.95**
50 pin conn.	**$5.95**
Dip Jumper 2 ft.	**$4.95**

6522 APPLE II INTERFACE

The JBE 6522 Parallel Interface for the Apple II Computer, plugs directly into any slot 1 through 7 in the Apple. This card has 2 6522 VIA's that provide:

- Four 8 bit bi-directional I/O ports
- Four 16 bit programmable timer/counters
- Serial shift registers
- Handshaking

A 74LS05 is for timing. Four 16 pin sockets provide easy connections to other peripheral devices. (Dip jumpers with ribbon cables are also available from JBE) The 6522 Parallel I/O card interfaces to the JBE EPROM programmer. Understanding of machine language required to use this board. Inputs and outputs are TTL compatible.

79-295A	**$69.95** Assembled
79-295K	**$59.95** Kit
79-295B	**$19.95** Bareboard

SPEECH SYNTHESIZERS

JBEs Speech Synthesizers use the Votrax SC-01 Phoneme Synthesizer chip. The SC-01 phonetically synthesizes continuous speech of unlimited vocabulary. The SC-01 contains 64 different phonemes and 4 levels of inflection accessed by an 8 bit code. It requires 10 Bytes per second for continuous speech. Both boards have an audio amp for direct connection to an 8 ohm speaker.

Documentation includes basic user programs, a phoneme chart and listing of coded words to help you get started. Documentation for the Apple II® Speech Synthesizer includes a disk with many user programs.

81-088 Apple II Speech Synthesizer	**$139.95**
81-120 Parallel Input Speech Synthesizer	**$149.95**

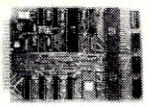
Prices include the SC-01 Chip
SC-01 sold separately for **$ 75.95**

EPROM EXPANSION CARD

JBE EPROM Expander for the Apple II holds six 5V 2716s for a total of 12K bytes of EPROM. This board takes the place of the on board ROM in the Apple. It is software switchable by the same technique used by the Apple II firmware card. Solder jumpers are for reset to the Apple ROM or EPROM Expansion Card. Use JBE EPROM Programmer and Parallel I/O to program your EPROMs. EPROMs sold separately.

81-085A Assm.	**$59.95**
81-085K Kit	**$49.95**
81-085B Bare Board	**$39.95**

81-260 "SLIM"



Single board large scale Integration Microcomputer. This 4.5 x 6.5 board uses the 6502 Microprocessor, two 6522 VIA's, four 2114 RAM's, 2516, 2716 or 2532 EPROM. The fully buffered 22/44 pin bus is similar to the KIM® , SYM® , and AIM® expansion connector. The four 8 bit I/O ports connect through 16 pin dip sockets. This board was designed for control and is ideal for Personal and OEM use.

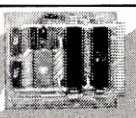
- 6502 MPU
- Two 6522 VIA's
- Four 2114 RAM's (2K bytes)
- One EPROM 2516 or 2532
- Crystal clock 1 Mhz
- Requires 5V 1AMP Power
- 4.5 x 6.5 card
- Power on reset
- Fully buffered-expandable
- Solder mask-both sides

Use your Apple II Computer, JBE 6522 Parallel Interface card and EPROM Programmer as a development system for SLIM.

Prices:

81-260A	**$199.95** Assembled
81-260K	**$149.95** Kit
81-260B	**$ 39.95** Bare Board

6502 MICROCOMPUTER

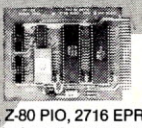


6502 MPU, 6522 VIA, 2716 EPROM, 2114 RAM single board computer. Single 5 volt power supply at 400 Ma. Two independent 8 bit I/O ports with handshake lines. RC controlled 1 Mhz clock.

Complete documentation. I/O lines use 50 pin edge connector. Data and address lines are not accessible. Mod. for 2532 is included. EPROM is not included. 1K RAM, 2K EPROM, 2 I/O ports.

80-153 Assm.	**$110.95**
80-153 Kit	**$ 89.95**
80-153 Bare Board	**$ 19.95**

Z-80 MICROCOMUTER

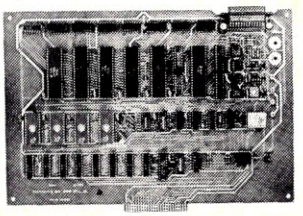


Z-80 MPU, Z-80 PIO, 2716 EPROM, 2114 RAM single board computer. Single 5 volt power supply at 300 Ma. Two independent 8 bit I/O ports with handshake lines. RC controlled 2Mhz clock.

Complete documentation. I/O lines use 50 pin edge connector. Data and address lines are not accessible. Mod. for 2532 is included. EPROM is not included. 1K RAM, 2K EPROM, 2 I/O ports.

80-280 Assm.	**$129.95**
80-280 Kit	**$119.95**
80-280 Bare Board	**$ 19.95**

JBE I MICROCOMPUTER



JBE's 7.75 x 11.75 6502 base Microcomputer has the capacity for 16K of EPROM, 4K of RAM, 8 Parallel Ports and 1 Serial Port. Monitor and Tiny Basic are also available. The fully populated version includes:

- 1 6502 CPU
- 4 6522 VIA (8 Parallel I/O Ports)
- 1 AY5-1013 (Serial I/O Ports)
- 8 2114 RAM (4K)
- 2 2716 EPROM (Monitor & Tiny Basic)

The partially populated version includes:

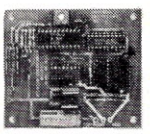
- 1 6502 CPU
- 1 6522 VIA (2 Parallel I/O Ports)
- 1 AY5-1013 (Serial I/O Port)
- 2 2114 RAM (1K)
- 1 2716 EPROM (with Monitor)

Both versions include sockets for 2716s or 2532s, 8 16 pin sockets for I/O interfacing and a DB25 connector for RS232.

All address and data lines are brought off the board to the 50 pin edge connector. (similar to the Apple II bus)

This board also features power on reset and cassette interface.

81-030 C Fully Populated	**$349.95**
81-030M Partially Populated	**$249.95**
81-030B Bare Board	**$ 89.95**
2716 EPROM (with Monitor)	**$ 19.95**
2715 EPROM (with Tiny Basic	**$ 19.95**



JOHN BELL ENGINEERING, INC.

ALL PRODUCTS ARE AVAILABLE FROM **JOHN BELL ENGINEERING, INC.** • 1014 CENTER ST., SAN CARLOS, CA 94070

ADD SALES TAX IN CALIFORNIA • ADD 5% SHIPPING & HANDLING 3% FOR ORDERS OVER $100

MC

SEND FOR CATALOG

(415) 592-8411

WILL CALL HOURS: 9am - 4pm

10% OUTSIDE U.S.A.

VISA

By Frank J. Derfler, Jr.

Communicating With Heavyweights

IBM, Osborne Flex Terminal Muscles

Dial-up Directory is a monthly column devoted to the use of microcomputers as data communications devices. This month, we're going to catch up on what's new with two of the most popular data communications programs on the market. Then we'll look at the communications capabilities of two hot-selling microcomputers: the IBM PC and the Osborne 1. Finally, I'll discuss a useful Basic program that turns your microcomputer into a remote banking device. But first, let me thank those of you who have bought my book, *Microcomputer Data Communications Systems* (some 3500 of you between December and February). The positive comments have been gratifying. Now, let's see what some other people have been writing.

Upgrades of Crosstalk and Omniterm

The good programs just keep getting better! Both Les Freed and David Lindbergh have been busy improving their respective programs, Crosstalk and Omniterm. Les Freed, at Microstuf, Inc., has released a new version of Crosstalk that has some nice features. Crosstalk is a smart terminal program for computers operating under CP/M that provides full file transfer ability and includes an error detection and retransmission file transfer program for error-free transmission of very large data files.

The new Crosstalk version 2.0 lets you toggle the printer off and on, to send up to four prestored strings of up to 50 characters, to open and close the capture buffer and to read the capture buffer on the screen, all while remaining in the on-line mode. These are significant improvements to the program! Crosstalk still permits capture and transmission of data files that are larger than the available RAM.

Les has also improved the documentation and the help commands. The documentation now includes a 51-page manual with several helpful appendices. The programmed help commands are available from an overlay file (in the fashion of WordStar), which reduces the size of the program while increasing the help capability available.

The serial version of Crosstalk has special features for use with the Hayes Stack Smartmodem—it will automatically dial the phone and offer to redial a number if connection is not established; the telephone numbers and other parameters for frequently-called systems can be stored in command files that let you tailor the program to the system you are communicating with; and the program permits auto-answer operation with the Smartmodem.

> I like the quality of engineering of the IBM PC– it looks and feels right. There is no television interference, even on fringe channels.

Crosstalk runs under Digital Research's CP/M operating system. It is now available for the IBM PC running under IBM PC DOS (see below). Les can supply the program in a large number of disk formats including Apple II+ CP/M and Osborne 1. Crosstalk owners can update their program by mailing the original disk back to Microstuf along with $20 for copying. Contact Microstuf, Inc., at their new address, 1900 Leland Drive, Suite 12, Marietta, GA 30067. 409-952-0267.

Omniterm

I don't know of anyone who does a better job of writing an operating manual than David Lindbergh. The latest release of Omniterm (version 1.52) comes with a 21-page manual that supplements David's already superb 75-page manual. David could have a good career writing novels if he ever gets tired of doing software.

Omniterm is a smart terminal program for the TRS-80 Model I or III that I've discussed several times in this column. It offers a great deal of processing power in a user-friendly format. The changes to Omniterm version 1.52 are subtle, but important. This version of the program will run with any DOS for the TRS-80 Model I/III including TRSDOS 1.3 on the Model III, NEWDOS 80, LDOS and all the others. A command has been added that lets the user view the disk I/O buffer in the same way that the receive buffer can be examined, allowing examination of the text before it is saved on disk. Previously, the received text could be reviewed only as it passed through a special review buffer.

A new display has been added to the command menu that shows the status of the RS-232C handshaking lines. This is valuable if you are troubleshooting the interface to a modem. Another major change in Omniterm version 1.51 and above is the ability to menu-select either the normal port address for the Radio Shack RS-232C serial card or the special port address of the Microconnection. This makes it easier to use a Microconnection modem.

Present owners of Omniterm could benefit from the updates David has made in his program. Lindbergh Systems will upgrade the original disk for $15. Note their new address: 41 Fairhill Road, Holden, MA 01520. 617-852-0233.

Me and My PC

I have an IBM PC and I'm very impressed! I will describe the communications abilities of the system, but first let me tell you some of the things I like and don't like. I like the quality of the

A New Age Has Begun

SDS Presents "The Professional" Series

For the first time ever, three packages encompassing all major Apple operating systems:

- ASCII Express "The Professional"™ for Apple DOS
- P-Term "The Professional"™ for Apple Pascal
- Z-Term "The Professional"™ for Apple CP/M

FORGET EVERYTHING YOU'VE EVER HEARD ABOUT COMMUNICATIONS SOFTWARE.

SDS now offers three new communication packages like no others on the market today. These packages are designed to operate alike, to look alike, and to be completely conversive with each other. An operator familiar with any one of these packages can easily operate the other two with minimal instruction. Absolutely no other packages can equal these outstanding features:

- All three packages are totally conversive with each other. ANY type of file may be transferred completely error-free within these or compatible systems utilizing the Christensen Protocol.
- Transfers may also include any ASCII based dial-up host computer. These flexible transfer capabilities are made possible by a wide variety of send options unique to SDS software.
- Support of ALL Apple-compatible modems and ALL display systems including any 80-column board or external terminal; 40-column too.
- Terminal emulation — allows your 80-column board or external terminal to "emulate" screen control codes of other terminals. Ideal for screen-oriented editors or data bases.
- Fully unattended answer mode features password only access and error-free transfer of files, as well as standard ASCII transfer modes.
- All packages support up to 1200 baud. Z-Term and ASCII Express support up to 4800 baud when interrupt-driven.
- Greatly enhanced macro system now includes programmable "hand shaking" macros — entire log-on sequences may be automatically executed. Also, many internal program commands may be initiated from macro control. Multiple macro libraries may be stored for use with a variety of hosts.

A NEW STANDARD OF EXCELLENCE

"The Professional" series is so innovative and superior to other packages in the field that it is truly in a class by itself. Our comparison chart gives a detailed point-by-point analysis of these and other communication packages. Write for it. You'll be convinced — when it comes to communication software, SDS stands alone.

SDS
southwestern data systems™

P.O. Box 582-K
Santee, CA 92071
714-562-3670

CP/M is a trademark of Digital Research.
Apple is a trademark of Apple Computers, Inc.

engineering—it looks and feels right. There is no television interference from the IBM, even on fringe channels. The only computer I have tested that is as free from rfi is the Atari 800. The accessory boards lock in securely and are well designed. The detached keyboard is a pleasure to use, but it would be even better if the enter/return key was bigger. The disk drive capacity is OK at 160K bytes, but the first thing I did was to ship my system off to Apparat in Denver to have double-sided drives installed.

The IBM DOS seems very familiar to CP/M users. Operators who are used to friendlier operating systems (TRSDOS for the Model III, NEWDOS 80, North Star DOS, etc.) may find it Spartan. IBM will certainly get a lot of comments on the file directory: Remember the old-style operating systems that let files scroll off the screen when you called for a directory? Well you had better read quickly if you want to see the listing of the first files on a crowded IBM DOS disk. I simply can't understand why Microsoft (who customized the DOS for IBM) didn't go to school on that one.

The color graphics available from the optional graphics card are a joy to use. IBM Basic makes good use of the keyboard's programmable keys and provides some powerful graphics commands.

Now for communications: The RS-232C serial board is optional on the PC. The IBM standard asynchronous adapter card occupies one of the five available expansion slots, but many companies are rushing combo cards to the market that will load at least three capabilities together. Apparat puts a parallel port, serial port and clock together on one board, and other companies are not far behind. I've suggested to several manufacturers that the PC is a natural for a bus-decoding modem such as the Hayes, Lynx or Microconnection. I haven't heard of one yet, but I believe it is only a matter of (a short) time until an integrated modem appears.

The IBM system disk comes with a dumb terminal program written in Basic. It's a good program, as free dumb terminal programs go. It has an easy-to-use

Pay-by-Micro Banking

By David R. Posh

Communication to Modem: RS-232 Serial Interface

My Vector Graphic system uses an 8251 USART chip to provide the RS-232 serial interface. Only two small routines in the program deal with this chip and they can be easily modified for another type of chip such as the 8250 UART. I have used Basic's Out and Inp () commands to communicate with the modem, avoiding any requirements, restrictions or translations imposed by Open or Print# commands.

Lines 1130–1180 initialize the USART. The first three Outs clear out any garbage that may be left in the chip's buffers and brings it to a known state. The Out of &H40 does a reset and specifies that the next byte sent is mode information. The Out of &H4F sets up asynchronous mode, eight data bits, one stop bit and 300 baud (the baud rate is relative to the clock frequency provided to the chip and may vary between systems). The Out of &H27 resets the USART's error status and turns on RTS and DTR.

Lines 2540–2610 are a subroutine to transmit the charcters in BUFFER$. The Inp on line 2570 reads the USART status into M. Line 2580 checks to see if the USART is ready to receive another character and, if so, transmits the next character.

No input routines are needed since no ASCII data is being received and the Smartmodem has been initialized to not echo characters or return result codes.

Communication to Modem: Smartmodem Local Commands

All commands to the Smartmodem begin with AT. The modem is initialized in lines 1200–1210. Following the AT in BUFFER$, the commands are EO (don't echo characters back to the computer), M2 (keep the monitor speaker on all the time), T (dial using Touch-Tones) and Q1 (don't send response codes back to the computer). All other commands to the Smartmodem use D (dial the following numbers) or H (hang up phone). All dial commands end with a semicolon to keep the Smartmodem in its local command mode (otherwise it would go into a mode waiting for the remote system to raise the carrier and would time out when the bank's computer didn't do this).

Cursor and Screen Control

This program uses cursor addressing to provide faster display of data (no spacing or tabbing from the left of the screen) and to allow the operator to use the cursor arrow keys to move the cursor to the menu selection. When the cursor is moved between selections, the current selection is highlighted in reverse video.

Line 1030 sets up a display width of 255 which inhibits Basic from inserting any carriage returns in the middle of messages. Line 1040 defines a function to generate the codes the Vector Graphic uses for cursor addressing. This line will probably have to be modified for another type of system. The function is set up for two parameters; the first is the line number (0–23) and the second is the column (0–79).

Lines 1050–1060 give names to the codes used to clear screen (CLS$), clear screen from cursor to end-of-screen (CEOP$), toggle reverse video (RV$), and to the characters generated for cursor up (UP$), cursor down (DN$), carriage return (CR$) and

(continued on page 24)

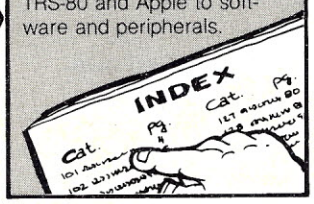
Program listing.

```
1000 ' PAYMASTER TERMINAL SOFTWARE
1010 ' BY POSH SOFTWARE
1020 '
1030 WIDTH 255
1040 DEF FNC$(X,Y)=CHR$(27)+CHR$(128+Y)+CHR$(128+X)
1050 CLS$=CHR$(132):RV$=CHR$(20):RET$=CHR$(13):BKSP$=CHR$(8):CEOP$=CHR$(16)
1060 UP$=CHR$(21):DN$=CHR$(18)
1070 SCMD=5:SDATA=4          ' PORT 5 FOR CMD/STATUS, PORT 4 FOR DATA
1080 '
1090 DIM VENDORNUM$(15),SEL$(15)
1100 ACCT$="D123456789#;"
1110 PIN$=""
1120 '
1130 OUT SCMD,0              ' INITIALIZE USART
1140 OUT SCMD,0
1150 OUT SCMD,0              ' (SEND 0 THREE TIMES TO CLEAR OUT GARBAGE)
1160 OUT SCMD,&H40           ' RESET AND MODE SELECT SUBCOMMAND
1170 OUT SCMD,&H4F           ' SET 300 BAUD ASYNC
1180 OUT SCMD,&H27           ' CLEAR ERRORS AND SET RTS & DTR ON
1190 '
1200 BUFFER$="E0M2TQ1" ' ECHO OFF, SPEAKER ON, TOUCH TONES, NO RESULT CODES
1210 GOSUB 2540              ' INITIALIZE MODEM
1220 PHONENUM$="D1-800-555-5555;"
1230 PRINT CLS$;
1240 GOTO 1430               ' ENTER PASSWORD (PIN), OR SELECT PRACTICE SESSION
1250 '
1260 SEL$(1)="DIAL Paymaster Computer"
```

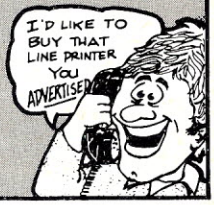
How to Buy or Sell Computer Equipment and Software

START HERE WITH...

Begin your search in the index of Computer Shopper's bargain filled pages. Locate the category and page number of items that interest you from TRS-80 and Apple to software and peripherals.



Start or add to your computer system by finding money saving bargains in each month's issue from individuals who no longer need their personal equipment.



You've got your computer hardware, but what about the software? Use a Computer Shopper ad to find what you need. Someone advertising in Computer Shopper probably has what you want.

If you need help with any computer related problem whether it's an interface problem or advice on the right peripheral for a homebrew system, use the free HELP column especially designed for that purpose.

As you outgrow your system or want to trade up (most dealers won't take trade-ins), use Computer Shopper ads to sell your items to 20,000 readers nationwide for the low cost of 12 cents per word.

Computer Shopper is THE nationwide magazine for buying, selling and trading Micro and Mini-computer equipment and software. Each issue has over 60 pages full of bargains of new and used equipment.

You can save hundreds of dollars by getting the equipment you need from the hundreds of classified ads individuals place in Computer Shopper every month.

Now is the time for you to join over 20,000 other computer users who save time and money with a subscription to Computer Shopper.

Subscribe today and get your first issue and a classified ad absolutely FREE. Type or print your ad on a plain piece of paper and send it along with your subscription.

Just fill in the coupon or MasterCard or VISA holders can phone **TOLL FREE 1-800-327-9920** and start making your computer dollar go further today.

Cut out and mail to: **COMPUTER SHOPPER**
P.O. Box F326 ● Titusville, FL 32780

Yes, I'll try Computer Shopper, I understand that if I'm not satisfied with my first issue I can receive a full refund and keep the first issue free.

☐ 1 year $10.00 ($30.00 in Canada)

☐ I have enclosed my free classified ad.

☐ I want to use my free ad later, send me a coupon.

NAME: _____

ADDRESS: _____

CITY: _____

STATE: _____ ZIP: _____

COMPUTER SHOPPER ✓36
P.O. Box F326 ● Titusville, FL 32780
Telephone: 305-269-3211

✓See List of Advertisers on page 130

Listing continued.

```
1270 SEL$(2)="Transmit Paymaster ACCOUNT Number"
1280 SEL$(3)="Transmit Paymaster PIN Number"
1290 SEL$(4)="Select BILL PAYING Transactions"
1300 SEL$(5)="Select CURRENT BALANCE"
1310 SEL$(6)="Select VERIFYING Whether a Check Has Cleared"
1320 SEL$(7)="HANG UP Phone"
1330 SEL$(8)="Setup Account and Pin Number for PRACTICE Session"
1340 IF PRACTICE=1 THEN SEL$(8)="Setup Account and Pin Number for REAL Session"
1350 SEL$(9)="Return To CP/M"
1360 NUMSEL=9:MENUNAME$="MAIN MENU":GOSUB 2650  ' GET SELECTION
1370 ON SEL GOTO 1530,1630,1700,1770,2190,2260,2410,1430,2480
1380 GOTO 1360
1390 '
1400 ' SETUP FOR PRACTICE OR REAL SESSION
1410 ' ===================================
1420 '
1430 PRINT FNC$(19,16);"Enter PIN Number, or RETURN for practice session";
1440 PRINT FNC$(20,16);"(     )";FNC$(20,17);
1450 MAXDG=4:GOSUB 2910
1460 IF LEN(FLD$)>0 GOTO 1480
1470 PRACTICE=1:ACCT$="D111111111#;":PIN$="D2222#;":GOTO 1260
1480 PRACTICE=0:ACCT$="D123456789#;":PIN$="D"+FLD$+"#;":GOTO 1260
1490 '
1500 ' DIAL PAYMASTER COMPUTER
1510 ' ========================
1520 '
1530 PRINT FNC$(19,16);"Dialing Paymaster Computer";
1540 BUFFER$=PHONENUM$
1550 GOSUB 2540                 ' SEND BUFFER TO SMARTMODEM
1560 FOR X=1 TO 3000:NEXT X     ' DELAY TO KEEP MSG ON SCREEN WHEN DIALING
1580 GOTO 1260
1590 '
1600 ' TRANSMIT PAYMASTER ACCOUNT NUMBER
1610 ' ==================================
1620 '
1630 BUFFER$=ACCT$
1640 GOSUB 2540                 ' SEND BUFFER TO SMARTMODEM
1650 GOTO 1260
1660 '
1670 ' TRANSMIT PAYMASTER PIN NUMBER
1680 ' ==============================
1690 '
1700 BUFFER$=PIN$
1710 GOSUB 2540                 ' SEND BUFFER TO SMARTMODEM
1720 GOTO 1260
1730 '
1740 ' SELECT BILL PAYING TRANSACTIONS
1750 ' ==============================
1760 '
1770 BUFFER$="D1#;"
1780 GOSUB 2540                 ' SEND BUFFER TO SMARTMODEM
1790 SEL$(1)="111111 Exxon"                         :VENDORNUM$(1)="111111"
1800 SEL$(2)="222222 Gulf"                          :VENDORNUM$(2)="222222"
1810 SEL$(3)="333333 Citibank MasterCard"           :VENDORNUM$(3)="333333"
1820 SEL$(4)="444444 Sears"                         :VENDORNUM$(4)="444444"
1830 SEL$(5)="555555 Visa"                          :VENDORNUM$(5)="555555"
1840 SEL$(6)="666666 City of Austin (Electric)"     :VENDORNUM$(6)="666666"
1850 SEL$(7)="777777 Southern Union Gas"            :VENDORNUM$(7)="777777"
1860 SEL$(8)="888888 Williamson County MUD (Water)":VENDORNUM$(8)="888888"
1870 SEL$(9)="      NO MORE BILLS TO PAY"           :VENDORNUM$(9)=""
1880 NUMSEL=9:MENUNAME$="BILL PAYING TRANSACTIONS"
1890 GOSUB 2650                 ' ENTER VENDOR SELECTION
1900 BUFFER$="D"+VENDORNUM$(SEL)+"#;"
1910 GOSUB 2540                 ' SEND BUFFER TO SMARTMODEM
1920 IF SEL=9 GOTO 1260
1930 PRINT FNC$(18,16);"Enter AMOUNT (Digits Only, EX: 5000 = Fifty Dollars)";
1940 PRINT FNC$(19,16);"(      )";FNC$(19,17);
1950 MAXDG=5:GOSUB 2910         ' ENTER AMOUNT OF BILL
1960 BUFFER$="D"+FLD$+"#;"
1970 GOSUB 2540                 ' SEND BUFFER TO SMARTMODEM
1980 PRINT FNC$(20,16);"Enter DATE to Pay (EX: 22 = 22nd of Month)";
1990 PRINT FNC$(21,16);"(   )";FNC$(21,17);
2000 MAXDG=2:GOSUB 2910         ' ENTER DATE TO WRITE CHECK
2010 BUFFER$="D"+FLD$+"#;"
2020 GOSUB 2540                 ' SEND BUFFER TO SMARTMODEM
2030 PRINT FNC$(22,16);"Ok? (Y or N) ";
2040 D$=INKEY$:IF LEN(D$)=0 GOTO 2040
2050 IF D$="Y" OR D$="y" THEN BUFFER$="D#;":PRINT D$;:GOTO 2080
2060 IF D$="N" OR D$="n" THEN BUFFER$="D*;":PRINT D$;:GOTO 2080
2070 GOTO 2040
2080 D$=INKEY$:IF LEN(D$)=0 GOTO 2080      ' WAIT FOR CARRIAGE RETURN AFTER Y/N
2090 IF D$=RET$ THEN GOSUB 2540:GOTO 1880  ' CARRIAGE RETURN
2100 IF D$=BKSP$ THEN PRINT D$;:GOTO 2040  ' BKSP CAN BE USED TO CHANGE ENTRY
2110 GOTO 2080
2150 '
2160 ' SELECT CURRENT BALANCE
2170 ' ======================
2180 '
2190 BUFFER$="D2#;"
2200 GOSUB 2540                 ' SEND BUFFER TO SMARTMODEM
2210 GOTO 1260
2220 '
2230 ' SELECT VERIFYING WHETHER A CHECK HAS CLEARED
2240 ' ============================================
2250 '
2260 BUFFER$="D3#;"
2270 GOSUB 2540                 ' SEND BUFFER TO SMARTMODEM
```

More

menu, and will operate at 1200 baud. It lets you set transmission parameters or, optionally, use the parameters set in the program for communications with The Source, Dow Jones and IBM series 1 computers. It does not provide for disk file transmission or for capturing received data in a disk file.

The PC has a variable-width screen display mode that's especially useful with systems like CompuServe and Apple Bulletin Boards that transmit short lines—the large text makes reading the screen for a long period of time much less tiring.

Crosstalk gives the PC some nice operating features and makes it into a fine intelligent terminal.

Crosstalk is now available for the IBM PC under the IBM DOS. The serial version of Crosstalk gives the PC some nice operating features and makes it into a fine intelligent terminal.

If you are marketing hardware or software for the IBM PC, let me know. There is a lot of reader interest in this system because of its capability, versatility, and its name.

Osborne 1

Similarly, the system that gives away a pile of software whose retail price almost equals the total price of the package is still creating quite a stir. Does the Osborne 1 communicate? It certainly does, but perhaps not quite the way you would expect. If you have seen an Osborne, you know it has a data port coming out of the front labeled "modem." Unfortunately, it is not a standard RS-232C serial I/O port. This particular port only supplies relatively low Transistor/Transistor Logic (TTL) voltage levels. Obviously, Osborne intended to provide a TTL modem to use on this port, but as of this writing it has not been seen.

Luckily, there is an RS-232C serial port next to the "modem" port and it works well with a standard modem if you have the proper software to address it.

The latest revision to the Osborne has modified the IEEE-488 bus so it will also drive a printer using the Centronics standard parallel printer interface. This is great news to anyone with an MX-80 or one of the other very common parallel printers.

The Osborne's screen display is 54

OHIO SCIENTIFIC USERS!

PERFORMANCE SOFTWARE

GENERAL BENEFITS PACKAGES FOR ALL 65U USERS
(V1.1 & V1.2)
RIDICULOUSLY AFFORDABLE

SEND FOR OUR FREE CATALOG

EXTEND YOUR EXISTING BASIC PROGRAMS TO:
increase io throughput between 20 — 200% - IOPAK
improve string performance, minimize garbage collection - STRINGPAK
output formatting statements - FORMATPAK
sort 1000 items in 10 seconds (on a 1 meg clock) - SORTPAK
device #8 modem program with output to printer - MODEMP
... and more

TRY OUR POTPOURRIPAK - INTRODUCTORY OFFER - $30

WE ALSO OFFER

BASIC LANGUAGE EXTENSION CUSTOM SERVICE
(ALMOST) ANY STATEMENT IMAGINABLE IS POSSIBLE
(65U only)

CUSTOMIZE YOUR BASIC! WE CAN CONFIGURE YOUR PROGRAMMING LANGUAGE TO SUIT YOUR APPLICATION NEEDS. SELECT YOUR OWN COMBINATION OF STATEMENTS FROM OUR CATALOG. ASK US TO WRITE NEW ONES FOR YOU. LET US CONVERT YOUR ASSEMBLY ROUTINES TO BASIC STATEMENTS.

WITH OUR SOFTWARE YOU CAN SUPERCHARGE YOUR EXISTING PROGRAMS AND START YOUR NEW ONES ON AFTERBURNER.

According to Funk&Wagnalls 1971 edition:
SUPERCHARGE – (soo·per·charj) vt. 1 To adapt (an engine) to develop more power, as by fitting with a supercharger.
AFTERBURNER – (af·ter·bur·ner) n. Aeron. A device for injecting extra fuel into the exaust system of a jet engine as a means of increasing the thrust.

Do yourself a favor
and send your request
for a catalog to:
↓
Bartleby's Software Service, Inc.
G.P.O. Box 1665 ✓211
New York, N.Y. 10116

P.S. Complete and lucid documentation provided, of course.

"The Software Sorcerers"

progressive computing

Z-FORTH IN ROM by Tom Zimmer
5 to 10 times faster than Basic. Once you use it, you'll never go back to basic! $ 75.00
source listing add $ 20.00

OSI FIG-FORTH True fig forth model for OS65D with fig editor named files, string package & much more $ 45.00

TINY PASCAL Operates in fig-forth, an exceptional value when purchased with forth.
TINY PASCAL & documentation $ 45.00
FORTH & TINY PASCAL $ 65.00

SPACE INVADERS 100% machine code for all systems with 64 chr. video. Full color & sound on C2, 4P & 8P systems. The fastest arcade program available. $ 9.95

PROGRAMMABLE CHARACTER GENERATOR $ 99.95
Use OSI's graphics or make a complete set of your own! Easy to use, comes assembled & tested.
2 Mhz. boards $109.95

PROGRAMMABLE SOUND BOARD $ 74.95
Complete sound system featuring the AY-3-8910 sound chip.
Bare boards available. $ 29.95

32/64 CHARACTER VIDEO MODIFICATION $ 39.95
Oldest and most popular video mod. True 32 chr. C1P, or 32/64 chr. C4P video display. Also adds many other options.

ROMS!!!
Augment Video Mod with our Roms. Full screen editing, print at selectable scroll, and many more features.
Basic 4 & Monitor $ 44.95
Basic 3 $ 15.95
All 3 for $ 59.95

65D DISASSEMBLY MANUAL, by Software Consultants
First class throughout. A must for any 65D user. $ 25.95

NUMEROUS BASIC PROGRAMS, UTILITY PROGRAMS AND GAMES ALONG WITH HARDWARE PROJECTS. ALL PRICES ARE U S FUNDS. Send for our $1.50 catalogue with free program (hardcopy) Memory Map and Auto Load Routine.

CHARGE: VISA

OSI Software & Hardware ✓202
3336 Avondale Court
Windsor, Ontario, Canada N9E 1X6
(519) 969-2500

3486 Countryside Circle
Pontiac Township, Michigan 48057
(313) 373-0468

CENTRONICS 779/RS LINE PRINTER I

MAKE YOUR PRINTER A REAL WORKHORSE WITH OUR NEW PRINTER CONTROLLER BOARD

Remove the controller board in your printer and plug ours in to add the following capabilities:

- Bidirectional printing
- Full UPPER/lower case ASCII *plus* TRS-80 graphics or DSE scientifics character sets in 9 x 7 dot matrix format (9 x 9 available as option — requires print head change)
- Motor control — turns off the motor when the printer is not in use
- 2048 character buffer
- Software selectable features
  - transfer protocol (XON/XOFF or none)
  - character densities (10, 12, 15, 16.5 cpi *plus* double width in each size)
  - self-test
  - plus more!

Introductory price
$295 assembled and tested
for orders placed before 6/30/82

DSE Digital Systems Engineering ✓61

Suite 400 Carolyn Building
10400 Eaton Place
Fairfax, VA 22030 **(703) 385-0900**

VISA, MasterCard, check, COD accepted

✓See List of Advertisers on page 130

characters wide. When wider lines are required, the screen scrolls horizontally to allow a maximum of 128 characters on one line. This screen width is no problem for data communications. All data services will allow the user to enter some kind of formatting directions to adjust the transmitted information to the screen. Because the screen is small, the letters are dense and quite easy to read in the normal operating position. Additionally, devices are now appearing on the market which combine the separate vertical sync, horizontal sync and video signals coming out of the Osborne monitor port into a standard composite video signal that nearly any monitor can use. (The composite video signal isn't pure, so some less-expensive monitors show a tearing or smearing of the screen.) The display is still only 54 characters wide before it scrolls over, but it's bigger.

The communications program recommended by Osborne for use on the Osborne 1 is Micro Link from Wordcraft. Micro Link is a smart terminal program with many good features. It will capture received data and save it to the disk, and it will transmit disk files to a host system using prompted transmission.

Micro Link is flexible, but its flexibility requires the user to read the manual carefully. It's not as easy to use as Crosstalk or Omniterm. For example, Micro Link requires several more commands to transmit a file in the prompted mode than do the other programs. The number of handshaking and formatting options available is impressive, but some

Listing continued.

```
2280 PRINT FNC$(19,16);"Enter CHECK NUMBER or RETURN When Finished";
2290 PRINT FNC$(20,16);"(Only for Checks Since Last Statement)";
2300 PRINT FNC$(21,16);"(      )";FNC$(21,17);
2310 MAXDG=5:GOSUB 2910          ' ENTER CHECK NUMBER
2320 BUFFER$="D"+FLD$+"#;"
2330 GOSUB 2540                  ' SEND BUFFER TO SMARTMODEM
2340 IF LEN(FLD$)=0 GOTO 1260    ' FINISHED SO GO TO MAIN MENU
2350 PRINT FNC$(19,16);CEOP$;    ' CLEAR BOTTOM OF SCREEN
2360 GOTO 2280
2370 '
2380 ' HANG UP
2390 ' =======
2400 '
2410 BUFFER$="H"
2420 GOSUB 2540                  ' SEND BUFFER TO SMARTMODEM
2430 GOTO 1260
2440 '
2450 ' RETURN TO CP/M
2460 ' ==============
2470 '
2480 PRINT CLS$;
2490 SYSTEM
2500 '
2510 ' SEND BUFFER TO MODEM
2520 ' ====================
2530 '
2540 BUFFER$="AT"+BUFFER$+RET$                    ' ADD "AT" & CARRIAGE RETURN
2550 FOR X=1 TO LEN(BUFFER$)                      ' TRANSMIT EACH
2560    A$=MID$(BUFFER$,X,1)                      ' CHARACTER SEPERATELY
2570    M=INP(SCMD)
2580    IF M AND &H1 THEN OUT SDATA,ASC(A$):GOTO 2600 ' IF READY, TRANSMIT
2590    GOTO 2570
2600 NEXT X                                       ' CONTINUE FOR EACH CHARACTER
2610 RETURN
2620 '
2630 ' MENU DISPLAY
2640 ' ============
2650 PRINT CLS$;
2660 PRINT FNC$(1,31);RV$;"PAYMASTER TERMINAL";RV$;
2670 PRINT FNC$(2,32);"By POSH SOFTWARE";
2680 PRINT FNC$(4,36-INT(LEN(MENUNAME$)/2));"*** ";MENUNAME$;" ***";
2690 PRINT FNC$(5,10);"Select the function you wish to perform by using the 'down-arrow'";
2700 PRINT FNC$(6,10);"and 'up-arrow' keys to place the cursor next to the description";
2710 PRINT FNC$(7,10);"of the function you want to perform.  Then press 'return'.";
2720 FOR X=1 TO NUMSEL
2730    PRINT FNC$(8+X,16);"( ) ";SEL$(X);
2740 NEXT X
2750 SEL=0:PRINT FNC$(8,17);
2760 C$=INKEY$
2770 IF LEN(C$)=0 GOTO 2760
2780 IF C$=RET$ AND SEL>0 THEN RETURN    ' SELECTION MADE
2790 IF C$<>UP$ AND C$<>DN$ GOTO 2760
2800 PRINT FNC$(8+SEL,20);SEL$(SEL);     ' NORMAL VIDEO TO PREVIOUS SELECTION
2810 IF C$=UP$ THEN SEL=SEL-1 ELSE SEL=SEL+1
2820 IF SEL=0 THEN SEL=1                 ' CAN'T SELECT # 0
2830 IF SEL>NUMSEL THEN SEL=NUMSEL       ' CAN'T SELECT BEYOND MAXIMUM AVAIL
2840 PRINT FNC$(8+SEL,20);RV$;SEL$(SEL);RV$; ' REVERSE VIDEO FOR NEW SELECTION
2850 PRINT FNC$(8+SEL,17);               ' PUT CURSOR BACK BETWEEN PARENTHESES
2860 GOTO 2760
2870 '
2880 ' ENTER FIELD
2890 ' ===========
2900 '
2910 FLD$="":DG=1
2920 D$=INKEY$:IF LEN(D$)=0 GOTO 2920
2930 IF D$=BKSP$ AND DG>1 THEN DG=DG-1:FLD$=LEFT$(FLD$,DG):PRINT D$;:GOTO 2920
2940 IF DG>MAXDG AND D$<>RET$ GOTO 2920
2950 IF D$=RET$ THEN RETURN
2960 IF D$<"0" OR D$>"9" GOTO 2920       ' ONLY 0-9 ALLOWED
2970 FLD$=FLD$+D$:DG=DG+1
2980 PRINT D$;
2990 GOTO 2920
```

(from page 20)

backspace (BS$).

The INKEY$ function is used for keyboard input so that the program can see each character as it is hit (such as the cursor arrow keys).

Modifications for UART 8250

If your computer uses the 8250 UART rather than the 8251 USART for serial interface, the following information will be helpful.

Rather than communicating through one command/status channel and one data channel, the 8250 uses a bank of eight channels. You will need to know the channel number of the first one; the remaining channels are specified relative to the first. The following assumes that the channel number of the first UART 8250 channel has been stored in the variable PORT.

Initialization:

```
1130 OUT PORT+1,0          'DISABLE INTERRUPTS
1140 OUT PORT+3,&H80       'PREPARE TO LOAD BAUD RATE
1145 'THE NEXT TWO COMMANDS WILL VARY DEPENDING ON THE CLOCK FREQUENCY
1146 'THIS EXAMPLE IS FOR A HEATH H-89 AT 2 MHZ
1150 OUT PORT+1,&H01       'HIGH ORDER BYTE OF DIVISOR
1160 OUT PORT,&H80         'LOW ORDER BYTE OF DIVISOR
1170 OUT PORT+3,&H03       '8 DATA BITS, NO PARITY, 1 STOP BIT
1180 OUT PORT+4,&H03       'TURN ON DTR & RTS
```

Transmitting routine:

```
2570 M=INP(PORT+5)
2580 IF M AND &H20 THEN OUT PORT, ASC(A$):
        GOTO 2600
```

Example

Following is an example of a typical bill-paying transaction. The @ character is used to indicate the cursor.

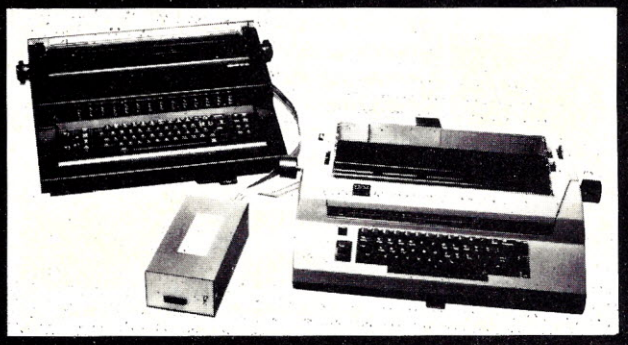
User: Load program, turn on Smartmodem, turn up volume on monitor speaker, make sure modem is connected to phone line.

Display: Enter PIN Number, or RETURN for practice session (@)

(continued on page 26)

IBM — XEROX — TRS-80 — CBM
HEWLETT-PACKARD — NORTHSTAR
DEC — HEATH — ZENITH — PMC
OSBORNE — OSI — INTERTEC . . .

WE HAVE



THE CONNECTION

Connect your IBM Selectric®, IBM Electronic, or Olivetti typewriter to any Microcomputer.

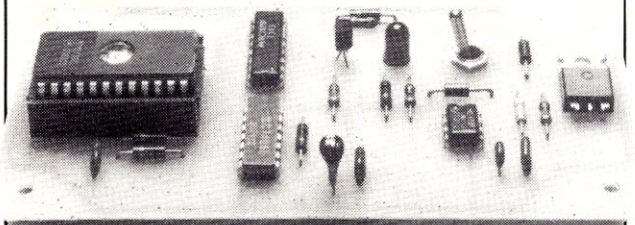
UNDER $600

ESCON Products, Inc.
12919 Alcosta Blvd.
San Ramon, Ca., 94583
(800) 227-2148 (415) 820-1256

↙116

EPROM PROGRAMMER

Shown assembled. EPROM not included.



For single supply 2516, 2716 & 2758 EPROMs. Connects through a user supplied interface to any computer system. Interfacing requires two 8-bit ports plus hand-shake lines. One of the ports must be software controllable for input or output. Timing is done via hardware, thus is independent of MPU clock rate. Verify erased. Program — entire or partial. Auto verify after programming. Transfer contents to RAM for modifying or duplicating.

Select Documentation for:	Interface to:
6502	6820 PIA or 6522 VIA
6800	6820 PIA
6809	6820 PIA
8080/8085/Z80	8255 PPI

Comprehensive documentation booklet contains schematic, instructions for construction, check-out and use, and a well commented assembly listing for the specified MPU.

Complete kit of parts (includes ZIF socket) . . . . . $ 45.00
Bare PC board and Documentation . . . . . $ 25.00
Software listings for additional MPUs
(with purchase of Kit or PC board) . . . . . $ 5.00

Ordering: Specify MPU. Add 5% for P&H. Overseas add 10%. Ariz. residents add 5% tax.

MasterCard **Micro Technical Products, Inc.** VISA
814 W. Keating Ave., Dept. K
Mesa, Arizona 85202 • 602-839-8902

C COMPILER
CP/M HDOS

MOVE INTO THE FAST LANE WITH THE . . .

AZTEC C COMPILER!

- ☐ **ALL C LANGUAGE FEATURES** EXCEPT BIT FIELDS
- ☐ **STRICT ADHERENCE TO THE DEFINITION OF C** *IN "THE C PROGRAMMING LANGUAGE" BY KERNIGHAN AND RITCHIE*
- ☐ FAST COMPILATION AND EXECUTION
- ☐ EXTENSIVE RUN TIME LIBRARY WITH STANDARD IO, STRING FUNCTIONS, UTILITY FUNCTIONS, AND CP/M OR HDOS INTERFACES
- ☐ **COMPILER WILL RUN UNDER CP/M or HEATH/ZENITH HDOS** — *UNIX PDP 11 cross compilers available*
- ☐ COMPILER PRODUCES ASSEMBLY LANGUAGE SOURCE THAT CAN BE ASSEMBLED AND LINKED WITH THE **RELOCATING ASSEMBLER AND LINKAGE EDITOR SUPPLIED WITH THE PACKAGE** OR WITH THE MICROSOFT MACRO-80 ASSEMBLER
- ☐ **YES WE DO SUPPORT:** static, initialized, and register variables + multi-dimensional arrays + true extern support for multi module linking and private library support + short and unsigned datatypes + structures and unions + while, for,do/while,switch/case, and goto + conditional compilation with #ifdef, #ifndef,#else,#endif + all C operators + declarations of complex datatypes + command line arguments (argc,argv) + fopen,printf,fclose,open,close,iseek, _format, . . .
- ☐ **ORDER BY PHONE OR MAIL — SPECIFY CP/M OR HDOS,AND DISK FORMAT.** IF YOU DO NOT HAVE K&R BOOK YOU SHOULD ORDER IT FOR A LANGUAGE REFERENCE MANUAL. ADD $3 for shipping to U.S. locations, $5 TO CANADA, $10 TO all other locations

AZTEC C II (AZTEC C with float and long support)	$195
WITH K&R BOOK	$211
AZTEC C II UPGRADE TO AZTEC C	$80
AZTEC C, ASSEMBLER, AND LINKER (does not support floats & longs)	$135
WITH K&R BOOK	$151
AZTEC C UNIX CROSS COMPILER (PDP 11)	$850

TECHNICAL SOFTWARE SYSTEMS ↙95
BOX 55, SHREWSBURY, N.J. 07701
(201) 780-4004

N.J. residents add 5% sales tax — Call or write for catalog

AZTEC C is a trademark of MANX Software Systems
CP/M is a trademark of Digital Research
UNIX is a trademark of Bell Labs

MasterCard VISA

↙See List of Advertisers on page 130

(from page 24)

User: Enters PIN (password)
Display:

Paymaster Terminal
by Posh Software
Main Menu

Select the function you wish to perform by using the down arrow and up arrow keys to place the cursor next to the description of the function you want to perform. Then press return.

@
( ) DIAL Paymaster Computer
( ) Transmit Paymaster ACCOUNT Number
( ) Transmit Paymaster PIN Number
( ) Select BILL PAYING Transactions
( ) Select CURRENT BALANCE
( ) Select VERIFYING Whether a Check Has Cleared
( ) HANG UP Phone
( ) Setup Account and Pin Number for PRACTICE Session
( ) Return to CP/M

User: Moves cursor down to dial entry and hits return
Speaker: Sound of dial tone, dialing, then computer voice "Welcome to University Savings Paymaster. Please enter account number." followed by a beep to indicate it is ready to receive
User: Moves cursor down to account menu entry and hits return
Speaker: Sound of dialing, then computer voice,"Please enter personal identification number." beep
User: Moves cursor down to pin menu entry and hits return
Speaker: Sound of dialing, then computer voice, "Please enter type of transaction." beep
User: Moves cursor down to bill paying menu entry and hits return
Speaker: Sound of dialing, then computer voice, "Your account balance is xxx dollars and xx cents. Please enter payment instructions." beep
Display:

Paymaster Terminal
by Posh Software
Bill Paying Transaction

Select the function you wish to perform by using the 'down arrow' and 'up arrow' keys to place the cursor next to the description of the function you want to perform. Then press 'return'.

@
( ) 111111 Exxon
( ) 222222 Gulf
( ) 333333 MasterCard
( ) 444444 Sears
( ) 555555 Visa
( ) 666666 Electric
( ) 777777 Gas Company
( ) 888888 Water/sewer bills
( ) NO MORE BILLS TO PAY

User: Moves cursor to Sears menu entry and hits return
Speaker: Sound of dialing, beep
Display: (added below menu selections): Enter AMOUNT (Digits only, EX: 5000 = Fifty dollars) (@)
User: Enters 1835 (amount of check) and hits return
Speaker: Sound of dialing, beep
Display: (added below amount entered): Enter DATE to Pay (EX: 22 = 22nd of Month) (@)
User: Enters 12 (date to write check) and hits return
Speaker: Sound of dialing, computer voice, "Pay vendor number 444444, amount eighteen dollars and thirty-five cents, on May twelfth. Please verify." beep
Display: (added below date entered): Ok? (Y or N) @
User: Enters Y and hits return
Speaker: Sound of dialing, computer voice, "Please enter payment instructions." beep
Display: (screen is cleared and original Bill Paying Transactions menu is displayed)
User: Moves cursor to "No More Bills To Pay" menu entry and hits return
Speaker: Sound of dialing, computer voice, "Your one payment totals eighteen dollars and thirty-five cents. Your account balance is xxx dollars and xx cents. Thank you for calling University Savings." click (their computer hangs up)
Display: (screen is cleared and original Main Menu is displayed)
User: Moves cursor to "Hang Up" menu entry and hits return
Speaker: Smartmodem hangs up phone
Dislay: (screen in cleared and original Main Menu is displayed)
User: Moves cursor to "return to CP/M" menu entry and hits return
Display: A>@

Modifications for Different Pay-By-Phone Services

The following documents three subroutines that are used extensively throughout the program. Modifications for a particular bill-paying service would likely involve changing the parameters that are passed to these routines, or adding/deleting GOSUBs to them.

Numeric Field Entry

This subroutine handles the input of any numeric field. As each key is hit, it is verified to be a numeric digit. Backspace key can be used for correction. It returns when the carriage return key has been hit.

Entry: GOSUB 2910
Parameters: Maximum number of digits in MAXDG
Returned: Number in FLD$

Menu Display and Selection

This subroutine displays a menu name, instructions and menu selections on the screen. It returns when the selection has been made.

Entry: GOSUB 2650
Parameters: Menu name in MENUNAME$
Selection descriptions in SEL$() array
Number of selections to use in NUMSEL
Returned: Selection number selected in SEL (can be 1 to NUMSEL)

Send Buffer to Modem

This subroutine handles the sending of data to the Smartmodem. The prefix AT is added, along with the suffix of the carriage return code.

Entry: GOSUB 2540
Parameters: Data to transmit in Buffer$
Returned: No parameters returned

Software for
NorthStar
Users

EXPENSE PROFILE **$29.95**
Now a program that really helps at income tax time. It summarizes expenses by categories and by person. Makes SEPARATE vs. JOINT TAX RETURN comparisons simple.
Promotes frequent review of spending habits. Guided by MENUS, add new expenses, categories, and users anytime. Quickly search to any item to make changes. Store expenses on disk automatically.

DYNAMIC BUDGET **$29.95**
Cope with rapidly changing economic conditions. Forcast effects of INFLATION on your family. CALENDAR built-in so recurring items like rent are entered only once.
Monthly listings of expenses, income, and balance. Change or add items anytime, data automatically stored on disk.

PATHFINDER DISASSEMBLER **$22.50**
Z80 or 8080 code. Pauses at each jump or call to allow you to follow program or continue straight ahead. Printer & video output.

KID MATH **$17.50**
Math drill. Watch speed, accuracy and confidence grow.

TAX FORMS **$49.50**
Fills out 1981 federal personal tax forms. Uses almost any printer. Write for details.

First class postage paid in U.S. MD residents add 5% tax.

The Software Connection
10703 Meadowhill Rd.
Silver Spring, MD 20901
302 Dept KB

of the possible combinations available are seldom seen in common operation.

Micro Link will not perform any kind of file transfer using error detection and retransmission. This is a feature found in many other CP/M programs (although they do not all use the same transfer protocol).

Micro Link does provide a powerful smart terminal capability that can be used in many different situations. The software is reasonably priced at $89.85. See your local Osborne dealer or contact Osborne Computer Corporation at 26500 Corporate Ave., Hayward, CA 94545. 415-887-8080. Crosstalk is also available for the Osborne 1.

Electronic Banking

Many banks and savings institutions provide their customers with the ability to transfer funds and pay bills through a push-button telephone. The bank customer selects certain functions from an electronically spoken menu of options by pushing a button on the phone. Other information, such as account numbers, verification codes, the creditor's reference number and actual money amounts, are entered by the customer using the telephone dial buttons. This is a pleasant convenience, but it requires good record

keeping and careful attention to detail. Record keeping and detail tending are things a computer does very well.

A computer needs two things to interface with a pay-by-phone banking system: the proper program, and some method of generating the dual-tone multi-frequency signals normally produced by the buttons on the phone. The Hayes Stack Smartmodem provides the needed signaling capability. Dave Posh has provided a Basic program that will do the work. (See program listing.)

Dave Posh is a programmer and consultant from Austin, TX. His program lets the bank customer use a microcomputer as a smart terminal to: 1) check the present balance in the account; 2) verify if a check has cleared; and 3) pay bills. The program is menu driven, and it has options that let you automatically dial the bank, transmit the needed account number and password, select any of the functions listed above, and even practice making payments without actually involving the bank. Dave's program is intended for use with MBasic and it is set to initialize the serial port on a Vector Graphic computer. He includes some information on initializing other serial devices.

This system wouldn't be practical if it weren't for the unique capabilities of the Smartmodem. The Smartmodem doesn't just autodial and send the needed tones—it also has a built-in speaker that allows the bank customer to hear the voice-synthesized responses from the bank's computer.

This system wouldn't be practical if it weren't for the unique capabilities of the Smartmodem.

It's interesting to note the irony of what we are doing with this system. The bank went to a lot of trouble to enable its customers to enter data from any telephone and to receive easily-understood voice synthesis responses. Now we've automated the tone production and probably wish the bank would reply in ASCII. None of this proves anything about the future of voice synthesis, data entry or remote banking, but it does show how different the needs and capabilities of individuals can be.

If you have any technical comments on the program, contact Dave Posh at PO Box 15681, Austin, TX 78761. Dave, thank you for sharing this program with us.

Micro-Courier—Revisited

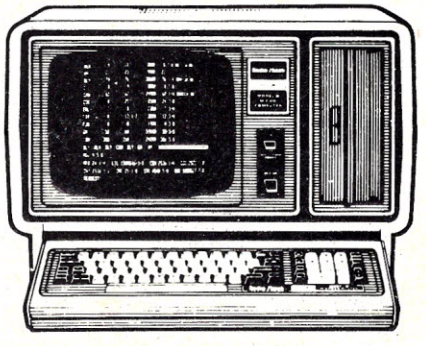
In the March 1982 issue of *Microcomputing* I reviewed a program called Micro-Courier for the Apple II. In the review, I stated that Micro-Courier did not perform error detection and retransmission during file transfer. The producer of the program, Microcom, insists that I am wrong. Gregor Ferguson, Software Product Manager for Microcom, says that Micro-Courier uses both character parity check and block checksum. Ferguson also points out that Micro-Courier will transmit binary files without conversion.

Sorry for missing the check and retransmission capabilities, but three of us worked on the program and none of us were aware of them.

Two-Way Communications

If you have any other different or unique uses for data communications devices, let's share them. Contact me at TCB967 on The Source, 70003,455 on CompuServe, or the AMRAD CBBS 703-734-1387. If you send paper mail, please include a stamped return envelope.□

Address correspondence to Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070.



DISCOUNT TRS-80® Computers

We have the Largest Inventory in the Central United States. Discount prices on all software and accessories for your TRS-80 computer needs.

Model II
26-4002
$3288.00

8 Megabyte
Hard Disk
(Primary)
26-4150.
$3994.00

BUY
DIRECT
Toll Free Order:
1-800-835-9056
Kansas Residents:
1-800-362-9091

★ No out of state Taxes
★ Immediate Shipment
★ Several Payment Methods
★ Direct Buying

Jimscot, Inc. ↙164
P.O. Box 607 - 1023 N. Kansas
Liberal, Ks. 67901

WRITE TODAY FOR YOUR FREE CATALOG!

® TRS-80 is a Registered Trademark of Tandy Corporation

↙See List of Advertisers on page 130

By Walter Koetke

Searching For Solutions

Getting There Is Half The Fun

Problem Solving

Although the availability of microcomputers has not changed the basic procedures important when problem solving, the microcomputer can help highlight those procedures. Many students develop the incorrect notion that obtaining an answer is the most important goal. Considering the examples that surround them, this is quite understandable. There are many production environments in which the correct solution is the only goal. The procedures used for obtaining that solution are of little importance as long as the solution is correct. Schools must, however, teach students the techniques of problem solving. While the solution may necessarily be the only goal in many other environments, schools must highlight the procedures for reaching that goal.

This month's column presents some problems that can be used when teaching the techniques of problem solving. None of the problems require any mathematics beyond first-year algebra, and none require specialized knowledge in other fields.

You are the most important part of this column. Neither the problems nor their answers will be of much future value. However, the procedures you develop when solving the problems may often be useful.

When solving a problem you should first be sure that you thoroughly understand the question, then make your plan for obtaining a solution. As you follow your plan toward the solution, keep re-evaluating it. Is the plan working as you intended? Can some of the steps be done more easily another way? Have you really considered all possible cases? Be very persistent. Even if you have the opportunity to see the correct answer before you solve the problem, don't look at it. Remember that the steps used to obtain the answer are far more important than the answer itself, and none of these steps are evident when you look at a simple statement of the solution.

Remember too that you should not be easily discouraged. Steps in the solution of many problems include frustration, errors, floundering and even some guessing. These steps can also include enjoyment and a great deal of satisfaction. The problems in this column are intended to provide you with all of these experiences.

Address correspondence to Walter Koetke, Putnam/Northern Westchester BOCES, Yorktown Heights, NY 10598.

Problem 1

Tell whether the following statement is true or false, and give reasons to demonstrate that your conclusion is correct. Don't just guess; obtain verifiable facts.

"If every person in the world was given a rug measuring 9 feet by 12 feet, all of the rugs could be spread flat on the ground in the state of West Virginia and no rug would touch any other rug."

Problem II

Write a Basic program that will translate entered numbers to their English names. Your program should work for all integers from −1000 through 1000. The output from several runs of your program should appear as:

```
RUN
INPUT VALUE? 67
SIXTY SEVEN
INPUT VALUE? -8
NEGATIVE EIGHT
INPUT VALUE? 18.3
INPUT MUST BE AN INTEGER
INPUT VALUE? - 1020
THAT VALUE IS OUT OF RANGE
INPUT VALUE?
```

As students develop a solution to this problem, many are likely to develop an algorithm that can be readily generalized. They will be able to extend the limits to ±1,000,000 with little or no difficulty.

Problem III

Write a Basic program that can be used to simplify expressions of the form $\sqrt{A}\sqrt{B}$, where A and B are any positive integers. The output from several runs of your program might appear as:

```
RUN
A AND B ARE? 5, 7
SIMPLIFIED FORM IS SQR ( 35 )
A AND B ARE? 8, 6
SIMPLIFIED FORM IS 4 *SQR( 3 )
A AND B ARE? 32, 2
SIMPLIFIED FORM IS 8
A AND B ARE?
```

Problem IV

A *palindrome* is a word, sentence,

Listing 1. Expanded version of Graphic Spaceships program that appeared in the October 1981 column. Submitted by Tom Traumann, a ninth grader at Brandywine High School in Wilmington, DE.

```
1 CLS
2 PRINT@15,"LEARNING WITH SPACESHIPS"
3 PRINT @79,"COPYRIGHT - KILOBAUD/MICROCOMPUTING -- OCT 1981"
4 PRINT @143,"FROM 'COMPUTER BLACKBOARD' BY WALTER KOETKE"
5 PRINT @207,"REVISED VERSION BY TOM TRAUMANN"
6 FOR T=1 TO 2000: NEXT T
10 CLS
20 C$=CHR$(170)+CHR$(191)
30 PRINT @991,C$;
31 PRINT @704,"SHOTS";:PRINT @763,"HITS"
32 PRINT @768,"-----";:PRINT @827,"----"
33 PRINT @832,S;:PRINT @890,H
35 S$=CHR$(128)+CHR$(128)+CHR$(128)+CHR$(140)+CHR$(140)+
   CHR$(143)
36 S$=S$+CHR$(140)+CHR$(140)+CHR$(128)+CHR$(128)+CHR$(128)
40 OVER=64 : DOWN=43
50 FLAG=0 : P=128
60 IF P=191-9 THEN C=-1
70 IF P=128 THEN C=1
```

More

Memory Expansion for Apple®

The company that brought you the first 32K RAM board for Apple II® and Apple II+® now offers:

VC-EXPAND/80™

NEW!

80 column VisiCalc® display on an Apple II !!

Now in addition to greatly expanding your workspace you can add 80 column capability to Personal Software's16 sector VisiCalc®. Works with Videx 80 column card. Previous owners of VC-EXPAND™ can upgrade to VC-EXPAND/80™ for $25.

ONLY **$125**

VC-EXPAND™

MEMORY EXPANSION FOR VisiCalc®

Expand memory available to Personal Software's 16 sector VisiCalc®. Add 32K, 64K, or even 128K to your present workspace (even if you already have a 16K card in use!) with this program plus one or more Saturn boards. Simple operation.

ONLY **$100**

■ 128K RAM

ALL FOR ONLY

$599

Our newest product. Fully compatible with Saturn's 32K RAM board, 16K RAM cards and language card.

Includes 5 comprehensive software packages:

1. MOVEDOS (relocates DOS)
2. RAMEXPAND (for Applesoft®, Integer®)
3. PSEUDO-DISK for DOS 3.3 or 3.2
4. PSEUDO-DISK for CP/M®
5. PSEUDO-DISK for PASCAL

■ 64K RAM

$425

A medium range memory expansion board which can be upgraded to 128K at a later date. (Upgrade kit sold for $175) Includes all 5 software packages offered with the 128K board.

■ 32K RAM

STILL ONLY

$239

The old favorite for Apple users. Includes our first 3 software packages (above) with CP/M® and PASCAL pseudo-disks now offered as options ($39 each).

SATURN SYSTEMS inc ✓117

(313) 973-8422

P.O. Box 8050, Ann Arbor, MI 48107

✓See List of Advertisers on page 130

number or anything else that reads the same backward as it does forward. The words "level," "radar" and "solos" and the numbers 44, 12321 and 7997 are all palindromes. Students should be familiar with data statements and subscripts before tackling this sequence of problems on palindromes.

A. Write a Basic program that will permit a user to enter *n*, then an *n* digit number. The output of the program should tell whether or not the entered number is a palindrome.

B. Consider the following two examples:

Given 97,

```
    97
   +79
   176
  +671
   847
  +748
  1595
 +5951
  7546
 +6457
 14003
+30041
 44044  ←A palindrome after six additions
```

Given 64,

```
    64
   +46
   110
  +011
   121  ←A palindrome after two additions
```

Write a Basic program that will permit a user to enter *n*, and then an *n* digit number. The output of the program should then be the number of additions required (as in the examples) before a palindrome is obtained.

The following two questions are decidedly more challenging than the previous two. You should complete part B before trying these.

C. Which of the integers 1 through 99 requires the greatest number of additions (as in part B) before a palindrome is obtained? How many additions are required for this number, and what is the palindrome that is eventually obtained?

D. Which of the integers 1 through 200 requires the greatest number of additions (as in part B) before a palindrome is obtained?

Problem V

Discussions of the use of random numbers and their applications to simulations have been widely published. Such discussions certainly should be in any mathematics or science text currently being used in secondary school classrooms. The following four problems are suitable when students are being introduced to the ideas of random numbers and simulation. In each case, a student in a first-year probability course should be able to calculate the answers with no computer support—just a calculator for the arithmetic. Obtaining the correct answer is not, however, the primary objective in solving the problems. The primary objective should be learning the techniques of developing accurate simulations.

A. Suppose that three coins are flipped together 500 times. How many times can you expect to obtain three tails?

B. Suppose that two ordinary dice are rolled 200 times. On how many rolls will the two dice show exactly the same number?

C. An elevator in an office building has broken down in an unusual way. When-

Listing 1 continued.

```
80 P=P+3*C
85 PRINT @832,S;:PRINT @890,H;
90 PRINT @P,S$;
100 IF FLAG=1 THEN 140
110 K$=INKEY$
120 IF K$<>" " THEN 60
125 S=S+1
130 FLAG=1
140 RESET(OVER,DOWN)
150 DOWN=DOWN-2
155 IF DOWN=5 AND S=10 THEN 240
160 IF DOWN<0 THEN DOWN=43 : FLAG=0 : GOTO 60
170 IF POINT(OVER,DOWN)=-1 THEN 200
180 SET(OVER,DOWN)
190 GOTO 60
200 CLS
205 H=H+1
210 PRINT @P,"KABOOM!";
225 FOR I=1 TO 50
226 NEXT I
227 GOSUB 1000
228 IF S=10 THEN 240
230 GOTO 10
240 CLS
242 PRINT "H =";H;PRINT "S =";S
244 T1=T1+10: Z1=Z1+H
245 Z=Z1*100/T1
250 PRINT "YOUR AVERAGE IS:",Z
260 PRINT "THE RANKS ARE AS FOLLOWS:"
265 PRINT
270 PRINT "CLASS              # OF POINTS"
275 PRINT "-----              ------------"
280 PRINT "GENERAL    (1)     85 - 100"
290 PRINT "COLONEL    (2)     70 -  84"
300 PRINT "MAJOR      (3)     55 -  69"
310 PRINT "CAPTAIN    (4)     40 -  54"
320 PRINT "CORPORAL   (5)     25 -  39"
330 PRINT "PRIVATE    (6)      0 -  24"
340 PRINT : PRINT
344 FOR I=1 TO 1700 : NEXT I
345 CLS
350 PRINT "YOUR RECORD MAKES YOU WORTHY OF THE FOLLOWING RANK":
351 FOR P=1 TO 500:NEXT P
352 CLS
353 FOR X=1 TO 500:NEXT X
355 PRINT @531,"ISN'T THE SUSPENSE KILLING YOU?"
357 FOR H=1 TO 600:NEXT H
358 CLS
360 IF Z>84 THEN 420
370 IF Z>69 THEN 430
380 IF Z>54 THEN 440
390 IF Z>39 THEN 450
400 IF Z>24 THEN 460
410 GOTO 470
420 PRINT "YOU ARE A GENERAL...CONGRATULATIONS"
425 GOTO 480
430 PRINT "YOU ARE A COLONEL...CONGRATULATIONS"
435 GOTO 480
440 PRINT "YOU ARE A MAJOR...CONGRATULATIONS"
445 GOTO 480
450 PRINT "YOU ARE A CAPTAIN...GOOD LUCK"
455 GOTO 480
460 PRINT "YOU ARE A CORPORAL...GOOD LUCK"
465 GOTO 480
470 PRINT "YOU ARE A PRIVATE...CARRY ON SOLDIER"
471 S=0:H=0
480 INPUT "DO YOU WANT TO PLAY AGAIN (Y OR N) 'ENTER'";C$
481 S=0:H=0
482 IF C$="Y" THEN 10
484 IF C$="N" THEN 486
486 PRINT "BYE"
488 END
1000 CLS
1010 PRINT @27,CHR$(176);PRINT @30,CHR$(140);PRINT @34,CHR$(131);PRINT @38,CHR$(
140);PRINT @41,CHR$(176);PRINT @155,CHR$(131);PRINT @158,CHR$(140);PRINT @162,CH
R$(176);PRINT @166,CHR$(140);PRINT @169,CHR$(131)
1020 FOR O=1 TO 50:NEXT O
1030 CLS
1040 PRINT @18,CHR$(140);PRINT @50,CHR$(140);PRINT @146,CHR$(140);PRINT @178,CHR
$(140);PRINT @216,CHR$(176);PRINT @236,CHR$(176);PRINT @290,CHR$(176)
1050 FOR O=1 TO 50:NEXT O
1060 CLS
1070 PRINT @9,CHR$(131);PRINT @59,CHR$(131);PRINT @201,CHR$(176);PRINT @251,CHR$
(176);PRINT @338,CHR$(176);PRINT @370,CHR$(176);PRINT @418,CHR$(176)
1080 FOR O=1 TO 50:NEXT O
1090 CLS
1100 PRINT @258,CHR$(131);PRINT @319,CHR$(140);PRINT @392,CHR$(140);PRINT @443,C
HR$(140);PRINT @531,CHR$(176);PRINT @561,CHR$(176);PRINT @674,CHR$(131)
1110 FOR O=1 TO 50:NEXT O
1120 CLS
1130 PRINT @449,CHR$(140);PRINT @511,CHR$(140);PRINT @582,CHR$(140);PRINT @637,C
HR$(140);PRINT @784,CHR$(131);PRINT @820,CHR$(131);PRINT @866,CHR$(176)
1140 FOR O=1 TO 50:NEXT O
1150 CLS
1160 RETURN
```

ever the elevator starts it moves exactly one floor, then stops again. To further frustrate the passengers, the elevator is always as likely to move up as it is to move down. Each evening Mr. Rider gets on the elevator at the fifth floor and tries to ride to the first floor. If he does this every day for 200 days, on how many days will he reach the first floor before he reaches the roof on the tenth floor?

D. A rather unusual game is played in the following way. Two coins are tossed together. If both are heads, you win 75 cents. If the coins are different, you win a dime. If, however, both are tails, you lose a dollar. If you play the game 1000 times, how much money should you expect to win/lose?

Problem VI

The topic of prime numbers is rich with challenging problems appropriate for computer solution, but requires little previous background in mathematics. I have addressed both of the following with sixth grade students. The resulting discussions and eventual student-written programs produced many problem-solving strategies as well as mathematical insights. The learning that occurs is a major reason for the importance of making microcomputers available to students.

A. Determine the smallest pair of consecutive prime numbers with a difference of 2, 4, 6, etc. Extend the following table as far as you can.

Difference	Smallest Pair of Consecutive Primes
2	3, 5
4	7, 11
6	23, 29
8	89, 97

B. If N is a prime number, is the number represented by $2N + 1$ also prime? A pair of numbers for which this property is true is called *prime chain*. For example, 2 is prime, and so is 2*(2) + 1, or 5. Thus, 2 and 5 are a prime chain. Of particular interest are prime chains containing more than one pair of numbers. For example, 5 is prime, and so is 2*(5) + 1, or 11. Thus, 2, 5, 11 form a prime chain of three "links." Can you demonstrate that 2, 5, 11, 23, 47 are a prime chain with five links? Determine another prime chain with five or more links.

Problem VII

Sorting algorithms is an appropriate topic in several high school and junior high school classes. Often, however, textbook discussions are very brief, providing no practical application and no discussion of algorithms beyond simple core sorts. The following problems are not especially difficult, yet obtaining their solutions will enhance a student's understanding of the application and difficulties of sorting.

A. Write a Basic program that will read all data in Table 1. Your program should then print two different lists, each containing all of the information in Table 1. The first list should be arranged in descending order of highest elevations; the second in ascending order of total area.

B. Writing programs that sort very long lists of data can become much more complicated than the previous problem. One reason for the increased complication is that all of the data may not fit into the computer's memory at one time. This can occur when one or even several tapes or disks filled with data are to be sorted. The purpose of this problem is to give you a feeling for the type of difficulties encountered when writing larger sorts.

Write a Basic program that will read an array of numbers L(1) through L(100), then print the numbers in ascending order. To simulate the situation of all data not fitting into the computer's memory, your program should be written with the following restrictions:

1. Excluding the variables L(1) through L(100), the program can use a maximum of 60 distinct variables.
2. The variables L(1) through L(100) can only be used as part of LET commands. They should never appear in any other command.
3. Each of the variables L(1) through L(100) can be read or written a total of no more than four times. Every appearance of a variable in the array L in a LET command should be counted as one read or one write for that variable.

The problems suggested in this column offer a broad range of difficulty. I have worked on all of these with students in grades 6 through 12, and all problems were successfully solved by the students. With a teacher's guidance stressing the process of obtaining a solution rather than the answer, each problem can be a valuable learning experience.□

State	Highest Elev. (feet)	Area (sq. miles)
AL	2407	51609
AK	20320	586412
AZ	12633	113909
AR	2753	53104
CA	14494	158693
CO	14443	104247
CT	2380	5009
DE	442	2057
FL	345	58560
GA	4784	58876
HI	13796	6450
ID	12662	83557
IL	1235	56400
IN	1257	36291
IA	1675	56290
KS	4039	82264
KY	4145	40395
LA	535	48523
ME	5268	33215
MD	3360	10577
MA	3491	8257
MI	1980	58216
MN	2301	84068
MS	806	47716
MO	1772	69686
MT	12799	147138
NE	5426	77227
NV	13140	110540
NH	6288	9304
NJ	1803	7836
NM	13161	121666
NY	5344	49576
NC	6684	52586
ND	3506	70665
OH	1550	41222
OK	4973	69919
OR	11235	96981
PA	3213	45333
RI	812	1214
SC	3560	31055
SD	7242	77047
TN	6643	42244
TX	8751	267339
UT	13528	84916
VT	4393	9609
VA	5729	40817
WA	14410	68192
WV	4862	24181
WI	1952	56154
WY	13785	97194

Table 1

LETTERS TO THE EDITOR

Hooked on a Program
Assembling the ZX81
Osborne Defended

```
10  HOME :T = 0
20  VTAB (5): PRINT  TAB( 7);"PUTTING PRACTICE"
30  FOR E = 1 TO 4: PRINT : NEXT E
40  INPUT "HOW MANY PRACTICE GREENS DO YOU WANT?";NU
50  FOR W = 1 TO NU
60  HOME : PRINT "HOLE";W
70 PU = 0
80 X =  INT (60 *  RND (1)) + 1
90  PRINT "TEE IS ";X;" FEET FROM THE HOLE."
100  REM  *THE HIGHER THE NUMBER OF STRENGTH, THE LONGER THE PUTT
110  INPUT "STRENGTH OF PUTT (1-14)?";ST
120 PU = PU + 1
125 T = T + 1
130  IF ST <  = 0 OR ST > 14 THEN  PRINT "BETWEEN 1 AND 14 PLEASE." GOTO 110
140 ST = ST * 4.3
150 X = X - ST
160  IF X <  = .9 AND X >  = .9 THEN  PRINT "RIGHT IN THE HOLE! NICE PUTT!": GOT
O 190
170  IF X <  - 1 THEN X =  ABS (X)
180  IF X >  = 1 OR X <  =  - 1 THEN  PRINT "YOU ARE NOW ";X;" FEET FROM THE CUP
.": GOTO 110
190  IF PU = 1 THEN  PRINT "IT TOOK YOU 1 TRY!": GOTO 210
200  PRINT "IT TOOK YOU ";PU;" TRIES."
210  FOR A = 1 TO 700: NEXT A
220  NEXT W
225  PRINT : PRINT "YOUR TOTAL FOR ";NU;" HOLES WAS ";T;" OR AN AVERAGE OF ";T /
 NU;"."
230  END
```

Listing 1.

Listing 2.

```
10   'Scrazzle
20   '       by
30   '
40   '     E. Stanton Maxey, M.D.
50   '
60   '
70   'See
     Scramble by Edward Rager
     Microcomputing, Jan/1981  pp78-80
80   'See
     Popping and Pushing Permutations
     in BASIC by Kenneth Wasserman
     Microcomputing, Dec/1981  pp50-51
90   '
100  '
110  PRINT"           S C R A Z Z L E":PRINT:PRINT:PRINT
120  PRINT"This program will accept test words"
130  PRINT"of three to seven characters length."
140  PRINT:PRINT"Lower case is first converted to"
150  PRINT"upper case."
160  PRINT:PRINT"The characters are then arranged"
170  PRINT"by ascii value.  Then all possible"
180  PRINT"combinations are printed in order"
190  PRINT"of ascending alphabetical value."
200  PRINT:PRINT"You may select the number of right"
210  PRINT"columns which you wish processed."
220  DEFSTR A
230  DEFINT V,L
240  PRINT:PRINT:PRINT:INPUT"Test word";A
250  PRINT"Number of right hand letters"
```

More →

Putting Practice

I am a 13 year old student who attends Friends School in Baltimore and they introduced me to computer science. I immediately took to it. I recently purchased an Apple II computer and I am now becoming a novice programmer. Listing 1 is a sample putting simulation program I made in Applesoft Basic.

Sam Steinbach
Baltimore, MD

Scrazzle

Did you ever get hooked by a couple of lines of Basic which you did not at first clearly understand? It happened to me with Kenneth Wasserman's "Popping and Pushing Permutations in Basic" (Dec. 1981, p. 50).

Does his program work on a MITS machine utilizing CP/M and Basic? Yes, beautifully and without any modifications.

The throughput does produce all possible combinations of letters contained in the input word. Suppose though, that you were looking for certain possibilities, e.g., words beginning with a specific letter. One has to concentrate like crazy to catch the desired words since the throughput comes tumbling forth in seeming total disregard for the ASCII value of the input.

It was apparent to me that this could be easily remedied. Use Basic's LEN function to find the length of the input word and a factorial as follows:

N = 1:FOR V = 1 TO L:N = N + N × (V – 1): NEXT

A DIM S$(N) instruction will then assure the proper space for all possible combinations. Using an appropriate VAL subroutine will save the words generated in alphabetical order; this means repositioning the generated words throughout much of the S$(L) array each time a new word is saved. Anyway, one can now use a FOR/NEXT loop to print out the words and they will properly appear in alphabetical order.

Operating at 2 MHz a MITS machine re-

DISK DRIVES

FROM: **SIEMENS**
NEW PRICES
EFFECTIVE 4-1-82

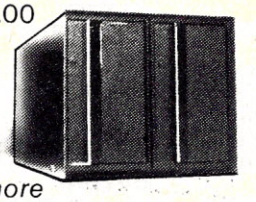
HARD DISKS & FLOPPIES FOR YOUR HEATH, RADIO SHACK, OSI & S-100 SYSTEMS

ATTENTION RADIO SHACK MOD I, MOD II AND MOD III USERS

Floppy Disk Services has disk drives for all your needs. Our 5¼ inch drives are tops for the Mod I. Our 8 inch drives are perfect for the Mod II! And our Dual sided 80 track units are perfect for the Mod III! All drives are brand new factory warranted.

5¼ DISK DRIVES (MODEL FDD-100-5b) *for Heath, RS MOD I, S-100, N. Star & more*

SIEMENS 5¼" drives are single sided, single or double density drives that are designed for years of trouble free service. These are the flippy models which other companies charge 15 to 30 dollars more for. The 5¼" is the exact same one used in the HEATH systems, but check our price!. NOW $240.00



5¼" WITH CASE AND POWER

Our 5¼" drives are also available in system packages. One 5¼" flippy in case with power supply tested $285.00
2 drives in dual case $585.00

80 TRACK - DOUBLE SIDED 5¼" *for Heath, CDR, RS MOD III, S-100 & more*

A new product from SIEMENS. This beauty is a new entry to the Floppy market. Get up to 800K Bytes storage on a 5¼" diskette. Model #FDD-221-5 ..... NOW$350.00 ea.

PACKAGE DEAL 80 TRACK 5¼"

1 dual sided 80 track drive *(in case with power supply)* $395. Two 80 track double sided *(in one enclosure)* $795.

8" FLOPPY DISK DRIVES (MODEL FDD-100-8d) *for Heath, OSI, S-100, RS MOD II & more*

SIEMENS 8" drives are single sided, single or double density with simple power requirements. +24 and +5 VDC. It has automatic diskette ejection and a fail safe interlock that prevents the door from closing on a partially inserted diskette. The track to track time is as fast as 4ms. These drives are completely compatible with your MOD II, OSI, and many other systems ..... NOW $340.00 ea.

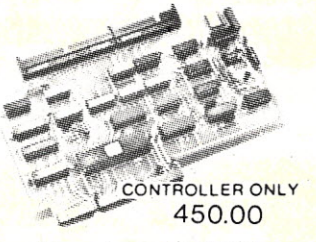
8" SYSTEM PACKAGES

One or two 8" SIEMENS drives with cabinet (choice of vertical or horizontal) power supply, all power connections, manuals and fan. A beautifully functional package built only of the best grade components. Available fuliy assembled and tested for $100.00 more.

Single 8" drive in dual cabinet ..... (data cables extra) $650.00
Dual drive package ..... (data cables extra) $980.00

ATTENTION HEATH H-88, 89 OWNERS

HEATH owners, we now have the CDR controller card that allows you to use our 8" drives on the H-88 or H-89 computers! You may mix any combination of 8" or 5¼" drives and also change your system to soft sectored formatting! Mix any combo single sided, double sided, single density or double density. We even include the zero origin prom. As a special offer we are giving you ALL necessary components with this system, even the patch for C/PM!

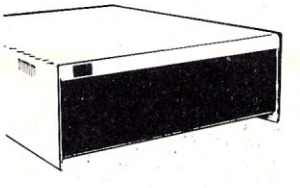


CONTROLLER ONLY
450.00

A complete dual 8" system for the H-88 or H-89 ..... $1450.00
Dual 5¼" 40 track system *with controller* $1050. Dual 5¼" 80 track system *with controller* $1250.

WINCHESTER TECHNOLOGY HARD DISK SYSTEMS

5 or 10 MEGABYTE Hard Disk systems for your HEATH H-88, 89, Radio Shack Mod I, II or III, Apple, IBM, or any S-100 system! You get a 5 or 10 megabyte formatted hard disk, power supply, cabinet, all interfacing cables, and CP/M boot loader. Most of all its all factory preassembled and tested, burned in and ready to run! You even get a real time clock (except HEATH). Built only of commercial grade components. ..... JUST $2400. 5mb and $2700. 10mb



quantity discounts available some of the 8" packages require assembly...we carry parts for siemens

PAYMENT POLICY
We accept Mastercard, Visa, personal checks & MO. We reserve the right to wait 10 working days for personal checks to clear your bank before we ship. All shipping standard UPS rates plus insurance. NJ residents must add 5% sales tax.

FLOPPY DISK SERVICES, INC

C.N.5212
PRINCETON, NEW JERSEY 08540 ↙191.

PHONE INQUIRIES WELCOME 9AM to 5PM (ET)
609·771·0374

PRICES & SPECIFICATIONS SUBJECT TO CHANGE

MOD II, CP/M are trademarks of Tandy and Digital Research respectively.

↙See List of Advertisers on page 130

DISCOUNT LINE
1-800-528-8960

GUARANTEED LOW PRICES

APPLE CARDS
16K RAM — $120 Z80 CARD — $279
Videx Card — $249 CPS CARD — $179
Graphic Card — $89 Clock CARD — $229

ALTOS
8000-2 — $2675 8000-15 — $3975

ANADEX
9500 — $1200 9501 — $1200

ATARI
400-16K — $349 800-16K — $669
410 — $59 810 — $429
825 — $569 850 — $149

C-ITOM
25CPS-P — $1299 45CPS-P — $1459

DATASOUTH
DS120 — $595 DS180 — $1259

DIABLO
630 — $1945 1640 — $2475

DISKETTES/BOXES
Plain — $20 Scotch — $25 Dysan — $35

EPSON WITH GRAPHICS
MX70 — $289 MX80 — $429
MX80FT — $519 MX100 — $689
GRAPHIC ROM — $79 RS232 — $69

HAZELTINE
1500 — $995 ESPRIT — $595

LOBO
Apple Drive/Card — $390/$90

MODEMS
HAYS — MICROMODEM — $290
Novation — Cat — $149
Penril — 300/1200 (212A) — $795

MONITORS
Teco-BW — $99 Teco-Green — $115
Sanyo-Green — $249 Color — $425
Amdek-Green — $159 Color — $349

NORTHSTAR
Advantage — $2995 HR64QD — $3025

NEC
8023 — $489 7710 — $2350

MPI
88G — $569 99G — $659

SOROC
120 — $659 135 — $689

TELEVIDEO
912 — $669 950 — $915

TI
810 — $1240 820 — $1795

SOFTWARE
All Major Brands — $CALL

MOUNTAIN HARDWARE
Romplus — $119 Music System — $429.00

OKIDATA
M80 — $325 SL125 — $3150
M82A — $459 SL250 — $4200
M83A — $729 M84 — $1179

XEROX
820 — $2399

ZENITH
Z19 — $669 Z89 — $2129

Arizona 1-602-246-1783

EXPOTEK CORPORATION
2231R W. Shangri La Rd.
Phoenix, AZ 85029

178

quired all of the first half of an Oakland Raiders vs Pittsburgh Steelers game and some of the halftime as well to process an input string of only six letters.

Why not generate the output in alphabetical order in the first place? Edward Rager's "Scramble" (Jan. 1981, p.78) could do this if the input words were properly re-ordered before being processed; but this brute force approach was slow.

Scrazzle (see Listing 2) is admittedly something of a microbrute. But it is also modestly elegant. A simple FOR loop (line 160) was developed to handle words of only three letters. The variable string A3 is set equal to the portion of the string which is to be processed. Left$(A,L-3) becomes the portion of the word requiring no processing and is prefixed to the six possible suffixes formed and printed in lines 620–690. Admittedly there is nothing elegant here.

Lines 570–590 are written in exactly the same fashion as lines 610–640 but process one higher order of significance. Actually, line 610 being called as a subroutine allows words of four letters. The algorithm is getting smart.

Lines 530–550, written in exactly the same way, call line 570 as a subroutine. This permits words of five letters. Cute.

Lines 490–510 are of the same logic and call line 530 to give words of six letters. Gorgeous.

Finally, lines 450–470 are written in equivalent fashion to yield words of seven letters. Similar routines can simply be added until words of any desired length are accommodated. The algorithm is both satisfactory and simple.

The remaining portion of the program is rather trivial. Lines 300–320 convert everything to uppercase. Line 260 allows you to process only a selected portion of the input word or, alternately, lines 350–380 will arrange your input word in alphabetical order. Line 400 then directs the word to an appropriate subroutine for processing at the proper level.

This program will output the 720 possible combinations of a six-letter input word in 56 seconds—more than eight times faster than Ken Wasserman's algorithm—and now everything is alphabetically ordered to boot.

E. Stanton Maxey
Stuart, FL

C1P Screen Clear

If you don't want to space out your screen, or scroll it away, here's a way to clear it instantly. With this routine you don't get the tacky effect that you do when poking spaces to the video RAM, or

(continued on page 131)

SOMEDAY . . . in the comfort of your own home or office, you'll be able to shop and bank electronically, read instantly updated major newswires, analyze the performance of a stock that interests you, send electronic mail to business associates across the country, then play Bridge with your best friend in San Francisco and two strangers in Chicago and Dallas.

WELCOME TO SOMEDAY

Someday is today with the CompuServe Information Service. All this and more can be accessed with a local phone call in most major U.S. cities. For hardware you need a terminal or personal computer and a modem. The CompuServe Information Service costs only $5.00 per hour, billed in minute increments to your charge card.

Ask for a demonstration at a Radio Shack® Computer Center. Videotex software is available for various brands of personal computers. CompuServe Information Service, 5000 Arlington Centre Blvd., Columbus, Ohio 43220. (614) 457-8650.

CompuServe

371

Listing 2 continued.

```
260 INPUT"to be manipulated";B
270 PRINT
280 L=LEN(A)
290 '
    Capitals only
300 FOR V=1 TO L:V1=ASC(MID$(A,V,1))
310 IF V1>96 THEN MID$(A,V,1)=CHR$(V1-32)
320 NEXT V
330 IF B<>0 THEN 400 ELSE B=L
340 '
    Sequence characters in ascending order
350 A=A+"z":FOR V=1 TO L
360 A1=MID$(A,V,1):A2=MID$(A,V+1,1)
370 IF A1>A2 THEN MID$(A,V,1)=A2:
    MID$(A,V+1,1)=A1:GOTO 350
380 NEXT V:A=LEFT$(A,L)
390 '
    Start at proper order of significance
400 ON B GOSUB 420,420,620,580,540,500,460
410 IF B<>L THEN 440
420 IF L<3 THEN PRINT"Word too short."
430 IF L>7 THEN PRINT"Word too long."
440 GOTO 240
450 '
    Seventh column significance
460 A7=RIGHT$(A,7):FOR V7=1 TO 7
470 A=LEFT$(A,L-7)+
    MID$(A7,V7,1)+LEFT$(A7,V7-1)+
    RIGHT$(A7,7-V7)
480 GOSUB 500:NEXT V7:RETURN
490 '
    Sixth column significance
500 A6=RIGHT$(A,6):FOR V6=1 TO 6
510 A=LEFT$(A,L-6)+
    MID$(A6,V6,1)+LEFT$(A6,V6-1)+
    RIGHT$(A6,6-V6)
520 GOSUB 540:NEXT V6:RETURN
530 '
    Fifth column significance
540 A5=RIGHT$(A,5):FOR V5=1 TO 5
550 A=LEFT$(A,L-5)+
    MID$(A5,V5,1)+LEFT$(A5,V5-1)+
    RIGHT$(A5,5-V5)
560 GOSUB 580:NEXT V5:RETURN
570 '
    Fourth column significance
580 A4=RIGHT$(A,4):FOR V4=1 TO 4
590 A=LEFT$(A,L-4)+
    MID$(A4,V4,1)+LEFT$(A4,V4-1)+
    RIGHT$(A4,4-V4)
600 GOSUB 620:NEXT V4:RETURN
610 '
    Third column significance
620 A3=RIGHT$(A ,3):FOR V1=1 TO 3
630 A=LEFT$(A,L-3)+
    MID$(A3,V1,1)+LEFT$(A3,V1-1)+
    RIGHT$(A3,3-V1)
640 '
    Second column significance
650 GOSUB 670:NEXT V1:RETURN
660 '
    Printout routine
670 IF POS(0)>38-L THEN PRINT:PRINT
680 PRINT" A"   ";
690 IF POS(0)>38-L THEN PRINT:PRINT
700 PRINT LEFT$(A,L-2)+RIGHT$(A,1)+
    MID$(A,L-1,1);
710 PRINT"   ";:RETURN
```


SUPERCALC
Financial Programs

Expand your BUSINESS application of SUPERCALC!

Financial System Overlay Programs™ permit the INSTANT use of SUPERCALC for PAYROLL, CASH DISBURSEMENTS, CASH RECEIPTS, ACCOUNTS RECEIVABLE, DEPRECIATION, CASH FLOW ANALYSIS and FORECASTING, OVERHEAD AND BUDGET ANALYSIS and many more under development.

Designed for the businessman who is not trained in financial accounting, but needs the data at his fingertips! Simple enough for your secretary to maintain!

Audio Cassette Instructions...NO MANUALS!
ALL PRICED UNDER $40
(On 5" and 8" Disk—All Formats
Load the same as any file you create.

Financial Overlay with Audio Instructions copyright 1982
MICRO Instructional Inc. SUPERCALC is a trademark of Sorcim Corp.

DEALERS CALL TOLL FREE 800-227-1617, EXT. 425 (IN CALIF: 800-772-3545, EXT. 425)

MICRO INSTRUCTIONAL INC

6299 W. SUNRISE BLVD., FT. LAUDERDALE, FL 33313, (305) 584-3133

Editor's Corner

Sweet Sixteen—Micros Come of Age

By Harold Nelson

Microcomputing Technical Editor

New and interesting 16-bit microcomputers seem to be popping up almost every other day. By now most everyone knows that the IBM Personal Computer uses a 16-bit processor. Not too long ago Fortune Systems announced its Fortune 32:16 microcomputer using the Motorola 68000 processor. Altos has released a multiuser 16-bit system using the Intel 8086. Corvus has announced its own intriguing 68000-based micro. We'll be taking a close look at these systems in upcoming months.

With all of the talk about the new 16-bit machines, we thought it was time to take another look at the powerful microprocessors around which these machines are designed. Different processors have different characteristics and capabilities which are reflected in the computer systems employing them. Knowing about the microprocessor used in a computer can be helpful in understanding some of the features of that computer. To help give you a better grasp of the 16-bit micros, we'll compare a few of the more popular processors, namely Motorola's 68000, Intel's 8086, Zilog's Z8000 and Texas Instruments' 9900.

Before comparing some of the features of these processors, we'll look at the general structure of a 16-bit device. No two microprocessors exactly fit the same description. We'll discuss some general concepts that do relate to all 16-bit devices. But keep in mind that designers and manufacturers implement these concepts differently.

The 16-bit Microprocessor

The first and most obvious characteristic of every 16-bit processor is that they can all process "words" consisting of strings of 16 1's and 0's. These 16-bit binary words may be either instructions to be executed, data to be worked on or memory locations to be addressed (actually, some processors use memory location addresses up to 24 bits long). Since instructions and data are usually stored in memory (sometimes peripherals such as disks are also used), the processor has to be able to get instructions and data from memory in order to execute programs. The processors mentioned above can directly address from 64K bytes to 16M bytes —up to 8,388,608 16-bit words of memory.

The processor deals with only one of these memory locations at a time. Each memory location has its own address consisting of a 15- to 24-bit binary number (for the devices being considered). The processor generates the address of the location with which it is to communicate. In order for memory to receive this address, the address lines of the microprocessor are connected directly or indirectly (via external devices) to the memory devices. This connection is called the address bus.

The microprocessor, using the address bus, selects a memory location from which it will read information or to which it will write information. This information is transferred between memory and microprocessor on a 16-line data bus, again connecting the processor to the memory devices (and most peripherals). A 16-bit address bus and a 16-bit data bus are represented in Fig. 1.

The processor also needs to communicate with memory in another way. It must be able to tell memory if it is to send or receive data. In

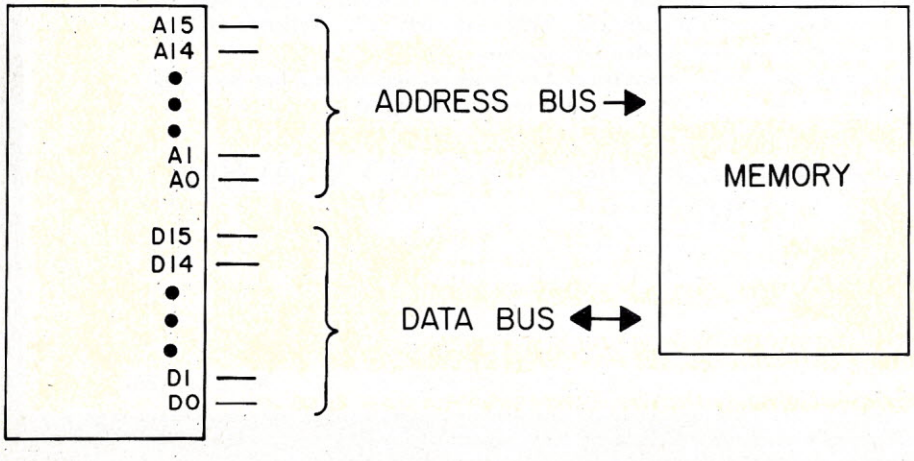


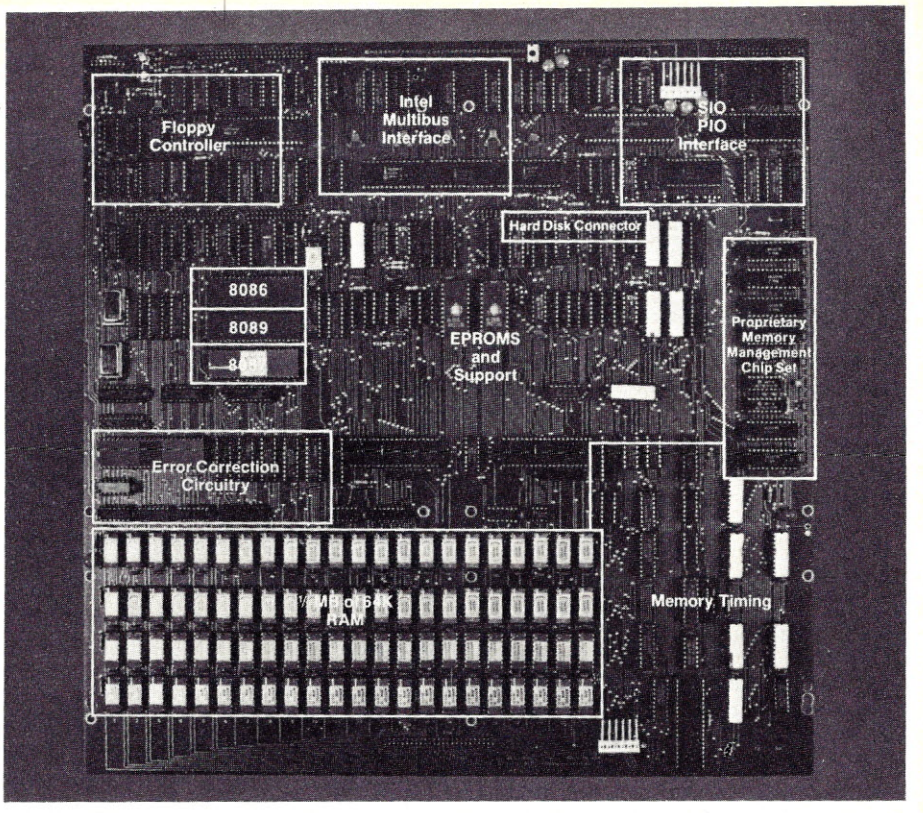
Fig. 1. 16-bit address bus and data bus.

other words, it needs a way to control the flow of information. This control is exercised via a third bus structure, of one or more signals, called a control bus.

All 16-bit processors have internal registers dedicated to performing tasks specified by their designers. Registers within the processor provide temporary storage for instructions, addresses or data to be worked on by the processor. Most microprocessors also have general-purpose registers whose use is under the programmer's control. Use of registers varies greatly among different microprocessors, as we will soon see.

In addition to being able to address great quantities of memory, the 16-bit devices have larger instruction sets than 8-bit processors. This means that a 16-bit processor can perform operations with the execution of a single instruction that would have required a separate subroutine on an eight-bit processor. The arithmetic operations of multiplication and division are typical examples of this 16-bit efficiency.

All of this—longer words, huge amounts of memory, more registers and larger, more complex instruction sets—makes designing systems around 16-bit processors and programming them on a machine-language level a great deal more involved than with eight-bit devices. Of course, working with such systems in high-level languages can be efficient and quite simple.



The Altos ACS8600 is a good example of the powerful system that can be designed around a 16-bit microprocessor—in this case an 8086. It is an eight-user single board computer with ½M bytes of memory onboard. The system can contain nine serial ports, one parallel port, and hard disk or magnetic tape storage as well as floppy disk storage. With Winchester drives total storage can go up to 40M bytes.

9900

The Texas Instruments 9900 is the oldest of the processors we will consider. TI and others have used the 9900 in a number of small systems including TI's 99/4(A) personal computer.

The 9900 is a 64-pin device. Fifteen of these are memory address lines (a sixteenth bit is used only inside the 9900 to distinguish between byte and word operations), 16 are data lines, with the remainder being power, timing and control signal lines.

The 9900 directly addresses up to 64K bytes or 32K 16-bit words of memory. It has three internal dedicated registers. The processor itself contains no general-purpose registers but uses up to 16 memory locations for this purpose. Any of these 16 registers can hold data or addresses while some can perform specific functions.

The instruction set of the 9900 consists of 72 basic instructions including instructions for data transfer, arithmetic operations, logical operations, transfer of control and I/O. Though this is not a large instruction set as 16-bit processors go (some have around 1000), the 9900 is a powerful and efficient processor.

Z8000

Actually, there is no Z8000 microprocessor. Zilog and second source, Advanced Micro Devices, market the Z8001 and the Z8002. The Z8002, a 40-pin chip, does not have all of the lines and registers of the 48-pin Z8001. As a result, the Z8002 can address 64K bytes of memory, while the Z8001 can address 8M bytes.

The Z8001's 48 pins contain 16 combined address/data lines, power, control, status and timing lines as well as seven additional address lines, upping the total to 23. This explains why the Z8001 can address so much more memory than the Z8002. With the aid of an external memory management device, the Z8001 can address up to 48M bytes of memory.

Of the Z8001's 23 internal registers, 16 are for general-purpose use. All can handle 16-bit words, some can be divided to contain eight-bit bytes and

OMNITEK COMPUTERS ✓ 140
INTERNATIONAL, INC.
1899 MAIN STREET
TEWKSBURY, MASS
617-851-4580

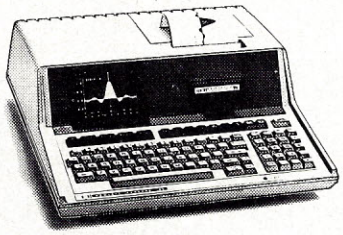
RS232 Direct Connect Modems.....99.00
Scotch S.S/S.D 5.25" Diskettes.....25.00
Verbatim 5.25" D. L.....25.00
16K RAM KITS.....14.00
TECO 12" B&G Monitor.....119.00
Okidata Microline 80.....329.00
Okidata Microline 82A.....449.00
Okidata Microline 83A.....699.00
Epson Mx-80.....479.00
Epson MX-80 FT.....579.00
Radio Shack MIII w/48K.....879.00
Radio Shack MIII w/48K and 2 40T dr
1699.00.....and RS232 ..1799.00
40 track 5.25" Tandon TM-100-1.284.00
80 track 5.25" Tandon Dual Head.484.00
5.25" Power Supply and case.....49.00
8" Power Supply and case.....99.00
CENTRONICS 739 Printer.....499.00

TRS-80 is a registered trademark of Tandy Corp.

Prices are for mail order only.
TERMS: Check, money order, Mastercard and Visa accepted. F.O.B. Tewksbury-freight extra. Mass residents add 5% sales tax. Write for FREE CATALOG.

✓ See List of Advertisers on page 130

PROFESSIONAL ORGANIZER
program for the
Hewlett-Packard HP-85



A specially crafted data base management program that accepts inputs from the keyboard or tape. Output is to the integral CRT, printer or tape unit. Or, use our linking facility to output to an external device. The system enables a user to create records consisting of up to 10 named fields. These are stored and manipulated in a 16,000 byte memory-resident file. Data may be manipulated using the commands: ADD, DELETE, CHANGE, INSERT, LIST, FIND, and TALLY. The program is particularly useful in applications such as maintaining small mailing lists, daily appointment organizers, parts lists, index creation and sorting, classifying projects and tasks that may have formerly been accomplished using index cards.

A special linking feature allows qualified users to customize additional operations if desired. (BASIC language programming capability required.)

Powerful machine language routines speed sort operations.

only $149.00 in U.S.

Try it out on our exclusive 10 day **money back if not satisfied*** trial plan! MasterCard and VISA credit card or U.S. C.O.D. customers phone (203) 888-1946 for immediate service.

Program is supplied on tape cartridge. Requires 32K system. Use is subject to the terms of a single-system license.

(Not available for HP-83 systems.)

(*Offered only to domestic customers.)

Please remit payment with your order.

name

address

city state zip

MasterCard or VISA number

bank nr. expiration date

signature of card holder

SCELBI, Inc. ↙ 146
35 Old State Rd.
Oxford, CT 06483

We have no affiliation what-so-ever with the Hewlett-Packard Company.

IBM chose the 8088 for its personal computer.

combinations can handle 32-bit and 64-bit words.

The instruction set of the Z8001 is large and contains a number of instructions to load and transfer data, several arithmetic instructions, logical instructions, instructions for I/O, for bit manipulations, for block transfer, control and control transfer instructions, string and translate instructions and interrupt instructions.

Finally, the Z8001 has the potential to communicate with up to 64K (65,536) eight-bit peripherals or 32K 16-bit peripherals.

8086

Intel's 8086 is a 40-pin device with 20 address lines, 16 of which are combined address/data lines. With a 20-signal address bus, the 8086 can access 1,048,576 memory locations (1M byte).

Of 14 total registers, eight are general purpose. But apparently, these are not as easy to use as the general purpose registers of other processors.

The large instruction set contains data transfer, arithmetic and logic instructions, instructions for control transfer, string manipulations and interrupts and processor control instructions.

This descendant of the 8080 is bound to be—in fact, already is—a very popular microprocessor. CP/M-86 has been designed for it. Also, the 8088, a cousin of the 8086, but with an eight-bit data bus, was the processor chosen by IBM for its personal computer.

We will be looking at these processors more closely in the months ahead.

68000

Like the 9900, the 68000 is contained in a 64-pin package and has separate address lines and data lines. It has a 16-bit data bus and a 24-bit address bus enabling the 68000 to directly address 16M bytes of memory.

While the other 16-bit devices can display eight-bit processor characteristics, the 68000 is a 16-bit processor with characteristics of a 32-bit device. For example, it contains 17 general-purpose 32-bit registers.

The instruction set has data transfer; integer and BCD (binary-coded decimal) arithmetic; and logical, bit manipulation, program control and system control instructions.

The 68000 has asynchronous control lines for 16-bit peripherals using its 16-bit data bus and synchronous control lines for eight-bit peripherals.

We are only starting to see the exciting machines being designed around this interesting processor.

* * *

Corrections

"A Computer/Video Disk Combo That Really Works!" by Anderson and Carr (*Microcomputing*, Jan. 1982, p. 102) contained some misinformation reproduced from the documentation of the Pioneer video disk player. Actually, if you carried out the project exactly as described, you would have no trouble and the system would work as claimed. If, however, like Steve Ciarcia, who discovered the problem, you do not take the IC from the Pioneer remote control unit for use in the PET to Pioneer adapter, you may encounter some difficulties. These will be caused by misinformation contained in Fig. 3 of the article. Steve found that the measurements given there would have been correct for a 42.918 kHz clock, not for a 38 kHz clock as indicated. Also, t2 in the word string (same figure) is listed as a 1 but shown as a 0. The corrected figure and caption, thanks to Steve, are given in Fig. 2. ■

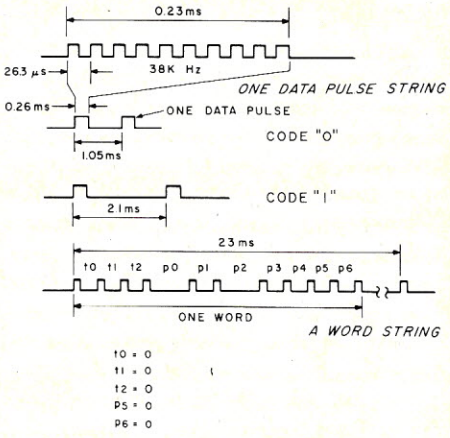


Fig. 2. Pioneer player control signals. One data pulse string is ten cycles of an approximately 38 kHz clock. The coding for a logical 0 is 1.05 ms, a short period between data pulse strings. The logical 1 is twice the logical 0 period, 2.1 ms. The word string delivered to the player is ten bits long; therefore, it consists of 11 actual data pulses. Of the ten bits used, five bits are a fixed code; the remaining five bits can form up to a maximum of 32 commands.

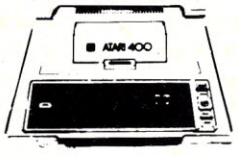
ATARI

ATARI 800

16K . . . $679
32K . . . $749
48K . . . $819

410 Recorder	$76.00
810 Disc Drive	$449.00
822 Printer	$269.00
825 Printer	$629.00
830 Modem	$159.00
820 Printer	$269.00
850 Interface	$169.00
New DOS 2 System	$29.00
CX30 Paddle	$18.00
CX40 Joy Stick	$18.00
CX853 16K RAM	$89.00
Microtek 16K RAM	$75.00
Microtek 32K RAM	$159.00
Ramdisk (128K)	$539.00
One year extended warranty	**$50.00**
INTEC 48K Ram	$249
481 Entertainer	$83.00
482 Educator	$130.00
483 Programmer	$57.00
484 Communicator	$344.00

ATARI 400

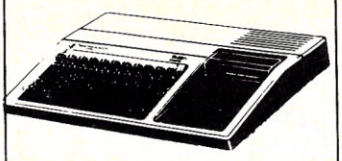


16K. . . . $329
32K. . . . $478
48K. . . . $555

Visicalc	$169.00
Letterperfect	$109.00
Ricochet	$14.50
Crush Crumble & Chomp	$24.00
Star Warrior	$29.00
Rescue at Rigel	$24.00
Datestones	$16.00
Invasion Orion	$18.50
Mission Asteriod	$22.00
MouskATTACK	$31.00
The Next Step	$34.00
Softporn	$27.00
Wizzard & Princess	$29.00
K-BYTE Krazy Shoot Out (ROM)	$39.00
Protector (Disk 32K)	$32.00
Jaw Breaker (on line disk)	$27.00
Ghost Hunter (cassette)	$24.00
Ghost Hunter (disk)	$30.00
PAC MAN	$35.00
Centipede	$35.00
Caverns of Mars	$32.00

We carry crystal software and Compumax Programs

Texas Instruments



TI-99/4A $299

Telephone Coupler	$169.00
RS-232 Accessories Interface	$169.00
Disk Drive Controller	$239.00
Disk Memory Drive	$389.00
Memory Expansion (32K RAM)	$319.00
R.F. Modulator	$43.00
Wired Remote Controllers(Pair)	$31.00
32K Expansion	$329.00
PHP Printer Solid State	$319.00
Home Financial Decisions	$26.00
Personal Record Keeping	$43.00
Mailing List	$60.00
Checkbook Manager	$18.00
Tombstone City 21st Century	$34.00
Munch Man	$34.00
TI Invaders	$34.00
Car Wars	$34.00

XEROX®

Xerox 820	
System I 5¼"	$2450.00
System II 8"	$2950.00
CPM 5¼"	$169.00
Word Processing	$429.00
Super Calc	$269.00

Monitors

Amdex 12" B&W	$129.00
12" Green	$139.00
13" Color	$349.00
Sanyo 12" B&W	$119.00
12" Green	$169.00
13" Color	$339.00
TI 10" Color	$349.00

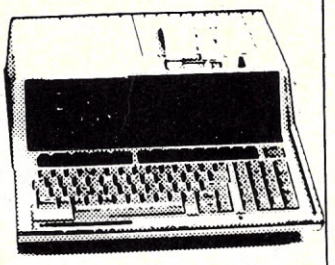
Terminals

Televideo	
910	$579.00
912C	$699.00
920C	$749.00
NEC	
12" B&W	$939.00
Adds	$549.00

Modems

Novation Auto	$239.00
D Cat	$169.00
Cat	$159.0
Hayes	
Smart	$239.00
Livermore Star	$119.00

HEWLETT PACKARD



HP•85 $1999

80 Column Printer	$799.00
HP•125	$1999.00
HP•83	$1699.00
HP•85 16K Memory Module	$169.00
5¼" Dual Master Disc Drive	$1929.00
Graphics Plotter (7225B)	$2079.00
NEW! HP•87	$1999.00
Hard Disk w/Floppy	$4349.00
Hard Disk	$3440.00
"Sweet Lips" Plotter	$1149.00

HP41CV Calculator
$249

41 C	$189.00
11 C	$119.00
12 C	$129.00
34 C	$117.00
38 C	$119.00
HP•41 Printer	$340.00

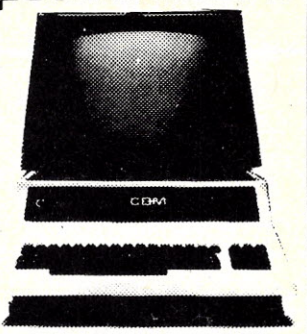
HPIL CALCULATOR PERIPHERALS

IL Modual	$104.00
Digital Cassette	$449.00
Printer/Plotter	$419.00
Card Reader	$164.00
Optical Wand	$99.00

PRINTERS

Centronics 739-3	$619.00
Centronics 739-1	$519.00
Diablo 630 Special	$1799.00
Epson	
MX70	$359.00
MX80	$469.00
MX80FT	Call
MX100	Call
NEC	
8023	$549.00
7730	Call
7720	Call
7710	Call
Okidata	
82A	$499.00
83A	$769.00
84	$1129.00
Citoh Starwriter	
F10-40 CPS	$1469.00
F10-55 CPS	Call
Paper	Tiger
445G	$699.00
460G	$899.00
560G	$1129.00
Talley	
8024-7	$1399.00
8024-L	$1629.00

commodore



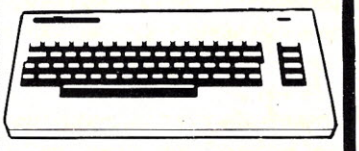
8032 $1069

4032	$969.00
4016	$769.00
8096 Upgrade Kit	$399.00
Super Pet	$1599.00
2031	$529.00
8050	$1299.00
4040	$969.00
8300 (Letter Quality)	$1799.00
8023	$769.00
4022	$599.00
Pet to IEEE Cable	$37.00
IEEE to IEEE Cable	$46.00
Tractor Feed for 8300	$240.00
8010 Modem	$229.00

SOFTWARE

COMMODORE MAGIS AVALON HILL
BPI PROFESSIONAL SOFTWARE
VISICORP CREATIVE SOFTWARE

VIC 20



$259

Commodore Catassette	$69.00
Disk Drive	$499.00
VIC Graphic Printer	$339.00
3K Memory Expander	$32.00
8K Memory Expander	$53.00
RS232C Terminal Interface	$43.00
VIC IEEE-488 Interface	$86.00
VIC 20 Super Expander	$53.00
Programmers Reference Guide	$15.00
Introduction to Computing	$19.00
Introduction to BASIC Programming	$19.00
Household Finance	$27.00
VIC Games	$19.00
VIC Home Inventory	$13.00
VIC Rec/Ed II	$13.00
Terminal	$13.00
Un Word	$13.00
Grafix Menagerie	$11.00
VIC PICS	$15.00
Ticker Tape	$13.00
Banner Headliner	$13.00
RS 232	$39.00

★★★

This author begins a series on what to look for in low-cost printers. The first to take the spotlight is the Centronics 739.

Survival Kit For Printer Buyers (I)

By Jim Hansen

This is the year when we finally get a real choice of under-$1000 printers. In fact, mail-order prices now range from about $300 to $1100 for 80-column printers. Careful shopping will uncover at least one printer in the $1300 range that will take full-width 15-inch paper.

This is the first of a series of reviews of low-cost printers which will explore several popular models from top to bottom. Each review will be written in the same general format so that you can easily compare printers, feature for feature. Each model will be tested under identical conditions to eliminate performance bias brought about by system variations.

I might as well confess now that I'm an engineer at an American printer company. I'm writing these reviews because I'm tired of reading reviews that superficially suggest that each product is the best in its market, that don't really tell you anything you couldn't read in an ad, and that don't increase the reader's computer fluency. I promise to play the game squarely, and hope you're still guessing where I work by the end of the series. If you have to know, send me a stamped, self-addressed postcard and I'll tell you.

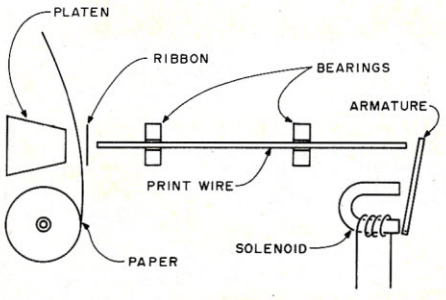


Figure 1. Schematic representation of a typical dot matrix head solenoid, needle, ribbon, paper and platen.

Printers in General

Before I start exploring this month's printer, let's look at the general considerations that go into the design of a low-cost dot matrix printer.

You can split a printer into several general sections. These include paper handling (moving the paper up and down), head motion control (moving the head side to side), head design, ribbon control, the printer control electronics and power supply.

Before you can print a dot on the paper, you must know where the printhead is. If it's at the right place, a dot is printed. The best way to know where the printhead is would be to read the position with some sort of encoder. Low-cost printers can't afford this luxury, so usually one of the following techniques is used.

A synchronous motor can be employed to regulate the speed of the head. If the controller knows when the head left the home position, it can determine where it is, based on the amount of time elapsed since leaving home. This results in a printer that will take the same amount of time to do a carriage return as it does to print a line. Character pitch (the number of characters per inch) is adjusted by changing the needle frequency (the number of times per second a needle is pulsed). The IDS 440/445 printers, now out of production, used this technique.

A stepper motor can be used to move the head. The speed of a stepper is controlled by the rate at which steps are sent to it. Since the controller knows how many steps have been sent, the position of the head is also known. In this case we could consider the stepper to be a sort of synchronous motor, because it will maintain speed synchronous with the step rate as long as nothing jams it. The advantage of this motor is that it can be run at nearly any speed with about the same accuracy to allow the head to be operated at its highest needle frequency. Character pitch is then controlled by changing the speed of the motor, allowing characters of any pitch to be printed at a rate determined solely by the head.

The final method of moving the head in a low-cost printer is that of a dc servo motor. In this case the controller has no way of knowing where the head is after the motor is turned on, so an encoder is required to report the position. Of all the low-cost printers, only the Centronics 739 (and its predecessors) use this technique.

Paper handling in low-cost printers is almost universally done by a stepper motor driving either the platen or paper tractors through a set of plastic gears or timing belt.

Ribbon drives are divided into two camps. Those printers that use reel-to-reel ribbons drive the ribbon with power taken from the head drive system. Examples of this are the Okidata and IDS-440 printers. Those with stuffer-box ribbons (Centronics 739,

Address correspondence to Jim Hansen, PO Box 234, New Boston, NH 03070.

IDS-445 printers and IDS 460) drive the ribbon with a separate motor. Epson drives a stuffer box from the head drive, the only one to do this.

It goes without saying that the simplified mechanics of low-cost printers had to result in complexity elsewhere. The elsewhere is in the printer controller. All low-cost printers use a microprocessor in the controller. In fact, we will see one that uses two. Power supplies are usually the standard linear regulated type, but Centronics uses a switching mode power supply.

Performance of the head determines how fast characters can be printed and how many copies can be made. A lot of physics is involved in head design. Currently low-cost printers use a "ballistic" type head. This means that a print wire is hammered on one end by a solenoid, then free-flies to the ribbon and paper where it impacts. Generally, a spring returns the wire to the home position.

The speed and forces are such that it is a wonder these heads work for more than an hour. In the typical head, the print needles will be struck 600 to 1000 times a second. Each time this happens they accelerate at 100 to 200 g's to a speed of about 100 inches per second. The actual impact with the ribbon and paper is short—on the order of five microseconds. Head design is understood well enough that most heads will now last 50 to 100 million characters.

The bearings that guide the print wires are very important, since they must precisely guide the wire without binding. Unless something destroys a solenoid coil, the usual head failure mode has something to do with the bearings. They must be able to withstand ribbon ink, fibers and paper dust. If these contaminants build up, the wires will sometimes stick, snagging the ribbon and jamming the head. Excessive wear will show up as crooked characters, and can be accelerated by people who discover they can re-ink their own ribbons with stamp pad ink. This kind of ink (and most others on the consumer market) is clay-based, and an excellent abrasive for matrix heads. Matrix ribbons have a special ink to avoid this problem.

Fig. 1 shows a sketch of the relationships of the solenoid, armature, print wires, bearings, ribbon, paper and platen. When the solenoid is energized, a magnetic field builds up, closing the armature which strikes

FREE with software purchase— One CPM Handbook

✓250 DISCOUNT Ad#25 SOFTWARE

ULTIMATE SOFTWARE PLAN

We'll match any advertised price on any item that we carry. And if you find a lower price on what you bought within 30 days of buying it, just show us the ad and we'll refund the difference. It's that simple.

Combine our price protection with the availability of full professional support and our automatic update service and you have the Ultimate Software Plan.

It's a convenient, uncomplicated, logical way to get your software.

✓ (New items or new prices)
* Special price of the month.

CP/M® — DISK WITH MANUAL / MANUAL ONLY

CP/M users: specify disk systems and formats. Most formats available.

ARTIFICIAL INTELLIGENCE®
Medical(PAS-3) $849/$40
Dental (PAS-3) $849/$40

ASYST DESIGN®
Prof Time Accounting $549/$40
General Subroutine $269/$40
Application Utilities $439/$40

COMPLETE BUS. SYSTEMS®
*Creator $199/$25
*Reporter $129/$20
*Both $299/$45

COMPUTER CONTROL®
*Fabs (B-tree) $119/$20
*UltraSort II $119/$25

COMPUTER PATHWAYS®
Pearl (level 1) $ 99/$25
Pearl (level 2) $299/$40
Pearl (level 3) $549/$50

DIGITAL RESEARCH®
CP/M 2.2
NorthStar $149/$25
TRS-80 Model II (P+T) $159/$35
Micropolis $169/$25
PL/I-80 $459/$35
BT-80 $179/$30
Mac $ 85/$15
Sid $ 65/$15
Z-Sid $ 90/$15
Tex $ 90/$15
DeSpool $ 50/$10
CB-80 $459/$35
CBasic-2 $ 98/$20

D.M.A.
Ascom $149/$15
Formula $539/$45

GRAHAM-DORIAN®
General Ledger $729/$40
Acct Receivable $729/$40
Acct Payable $729/$40
Job Costing $729/$40
Payroll II $729/$40
Inventory II $729/$40
Payroll $493/$40
Inventory $493/$40
Cash Register $493/$40
Apartment Mgt $493/$40

MICRO-AP®
S-Basic $269/$25
Selector IV $295/$35
Selector V $495/$50

MICRO DATA BASE SYSTEMS®
HDBS $269/$35
MDBS $795/$40
DRS or QRS or RTL $269/$10
MDBS PKG $1295/$60

MICROPRO®
WordStar $319/$60
Customization Notes $429/$na
Mail-Merge $109/$25
WordStar/Mail-Merge $419/$85
DataStar $249/$60
WordMaster $119/$40
SuperSort I $199/$40
Spell Star $175/$40
CalcStar $259/$na

MICROSOFT®
Basic-80 $298
Basic Compiler $329
Fortran-80 $349
Cobol-80 $629
✓M-Sort $175
✓Macro-80 $144
Edit-80 $ 84
MuSimp/MuMath $224
MuLisp-80 $174
Multi Plan Call
Manager Series Call

ORGANIC SOFTWARE®
TextWriter III $111/$25
DateBook II $269/$25
Milestone $269/$30

OSBORNE®
General Ledger $ 59/$20
Acct Rec/Acct Pay $ 59/$20
Payroll w/Cost $ 59/$20
All 3 $129/$60
All 3 + CBASIC-2 $199/$75
Enhanced Osborne $269/$60

PEACHTREE®
General Ledger $399/$40
Acct Receivable $399/$40
Acct Payable $399/$40
Payroll $399/$40
Inventory $399/$40
Surveyor $399/$40
Property Mgt $799/$40
CPA Client Write-up $799/$40
P5 Version Add $129
MagiCalc $269/$25
Other less 10%

SOFTWARE WORKS®
*Adapt (CDOS to CP/M) $ 49/$na
*Ratfor $ 68/$na

SOHO GROUP®
*MatchMaker $ 89/$20
*WorkSheet $159/$20

STRUCTURED SYSTEMS®
Business Packages, Call for Price

SORCIM®
SuperCalc $269/$na
Trans 86 $115
Act $157

TCS®
GL or AR or AP or Pay $ 79/$25
All 4 $269/$99
Compiled each $ 99/$25
Inventory $ 99/$25

SUPERSOFT®
Diagnostic I $ 49/$20
Diagnostic II $ 84/$20
Disk Doctor $ 84/$20
Forth (8080 or Z80) $149/$30
Fortran $219/$30
Fortran w/Ratfor $289/$35
C Compiler $174/$20
Star Edit $189/$30
Other less 10%

UNICORN®
Mince $149/$25
Scribble $149/$25
Both $249/$50

WHITESMITHS®
"C" Compiler $600/$30
Pascal (incl "C") $850/$45

"PASCAL"
Pascal/MT+ Pkg $429/$30
Compiler $315
Sp Prog $175
Pascal/Z $349/$30
Pascal/UCSD 4.0 $670/$50
Pascal/M $355/$20

"DATA BASE"
FMS-80 $649/$45
dBASE II $595/$50
Condor II $899/$50

"WORD PROCESSING"
WordSearch $179/$50
SpellGuard $229/$25
VTS/80 $259/$65
Magic Wand $289/$45
Magic Spell $269/$25
Spell Binder $349/$45
Select $495/$na
The Word $ 65/$na

"OTHER GOODIES"
Micro Plan $419/$na
Plan 80 $269/$30
Target $189/$30
BSTAM $149/$na
BSTMS $149/$na
Tiny "C" $ 89/$50
Tiny "C" Compiler $229/$50
Nevada Cobol $179/$25
MicroStat $224/$25
Vedit $130/$15
MiniModel $449/$50
StatPak $449/$40
Micro B+ $229/$20
Raid $224/$35
String/80 $ 84/$20
String/80 (source) $279/$na
ISIS CP/M Utility $199/$50
Lynx $199/$20
Supervyz $ 95/$na
✓CP/M Power $ 75/$na
✓Mathe Magic $ 95/$na

APPLE II®

INFO UNLIMITED®
EasyWriter $199
Datadex $249
EasyMailer $128
Other less 15%

MICROSOFT®
Softcard (Z-80 CP/M) $298
Fortran $179
Cobol $499
Tasc $139

MICROPRO®
Wordstar $269
MailMerge $ 99
Wordstar/MailMerge $349
SuperSort I $159
Spellstar $129

PERSONAL SOFTWARE/ VISICORP®
Visicalc 3.3 $225
Desktop/Plan II $225
Visiterm $ 90
Visidex $225
Visiplot $180
Visitrend/Visiplot $300
Visifile $225

PEACHTREE®
G/L, A/R, A/P, Pay or Inventory (each) $224/$40

"OTHER GOODIES"
*VU #3R (use w/Visicalc) $ 49
*Context Connector (use w/Visicalc) $ 99
Micro Courier $219
Super-Text II $127
Data Factory $134
DB Master $184

IBM PC SOFTWARE

✓Business/Med/WP Call for Price

8086 SOFTWARE
✓CBASIC 86 $300/$na
✓Pascal MT + 86 Pkg $730/$na
✓Pascal UCSD 86 $700/$na
✓Macro 86 $259/$na

ORDERS ONLY—CALL TOLL FREE VISA • MASTERCHARGE
1-800-854-2003 ext. 823 • Calif. 1-800-522-1500 ext. 823

Outside Continental U.S.—add $10 plus Air Parcel Post • Add $3.50 postage and handling per each item • California residents add 6% sales tax • Allow 2 weeks on checks, C.O.D. $3.00 extra • Prices subject to change without notice. All items subject to availability • ®—Mfgs. Trademark. Blue Label $3.00 additional per item.

THE DISCOUNT SOFTWARE GROUP
6520 Selma Ave. Suite 309 • Los Angeles, Ca. 90028 • (213) 837-5141
Int'l TELEX 499-0446 DISCSOFT LSA • USA TELEX 194-634 (Attn: 499-0446)
TWX 910-321-3597 (Attn: 499-0446)

✓See List of Advertisers on page 130

the back end of the print wire. Ideally, the magnetic field should build up quickly, saturating the core of the solenoid. As soon as the armature is closed and the print wire is on its way, the field should collapse as soon as possible. After the magnetic field has dissipated, the armature may stick closed. The print wire, on its return flight, is often used to unstick the armature, which must return to its home position before the next dot is printed.

Current flow in each coil of the typical head is heavy—2 to 3 A. Because the head coil is an inductor which resists changes of current flow, high voltage is used to energize the coils in the time allowed. The voltages are usually in the 20 to 60 V range. Overall efficiency is quite low, generally less than 5 percent, which is why heads get hot during operation.

Printer speed is determined solely by the maximum needle rate of the head. Let's say we wanted to print characters five dots wide with a sixth dot for spacing. If the maximum needle rate was 600 pulses a second, we could print 100 characters per second.

At ten characters per inch the carriage would have to move ten inches per second. Carriage return and line feed time cut down the number of characters printed per second, simply because nothing is printed then. If the needle rate were doubled, throughput, or the lines printed per minute, would increase, but not necessarily double, again because of carriage return and line feed overhead.

Bidirectional printing can in some cases help throughput. This is because the printhead does not always have to print from the left margin—it can wait until the following line has been received, then print it from the right margin.

If the printer also has logic seeking, the head seeks to the nearest end of the next line and prints left to right or vice versa as required, further reducing head travel overhead and printer wear.

```
THIS IS MONOCASE 10 CPI
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
qrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
qrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFG
HIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmn
opqrstuvwxyz{|}~

THIS IS PROPORTIONAL 10 CPI
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFG
HIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmn
opqrstuvwxyz{|}~

THIS IS MONOCASE 16.7 CPI
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFG
HIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmn
opqrstuvwxyz{|}~

THIS IS A GRAPHICS TEST
```

Listing 1. Print samples produced on Centronics 739 printer. Notice the difference in the monocase and proportional fonts—especially the lowercase descenders when underscored. At ten characters per inch (ten cpi) monocase the 739 is a standard 80-column printer; at 16.7 cpi it can print 133 columns on an eight-inch page.

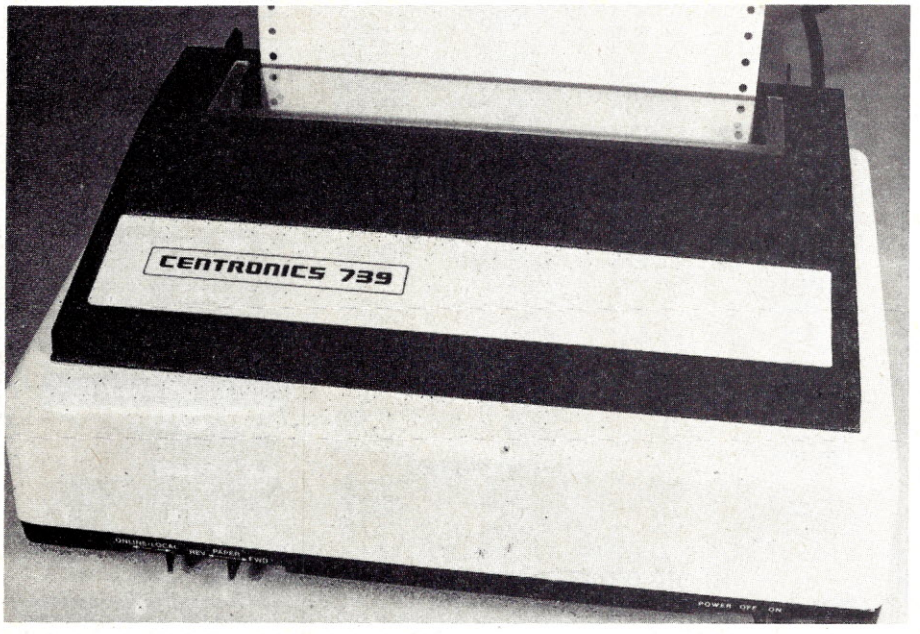


Photo 1. User's view of the Centronics 739 printer. All manual controls are located along the bottom front edge. These include the power, on-line/off-line and paper feed switches. The paper feed moves in single steps with each push of the switch. If the switch is held in either direction, the paper will slew after a short delay.

The Centronics 739

With this overview of printer operation, let's look at the Centronics 739 printer, introduced at last year's NCC.

Externally, it looks much like the previous 730 series of printers. It is small (14½ inches wide by 5 inches high) and weighs about 12 pounds. Inside, all electronics are included on a single printed circuit board. It uses an 8055 microprocessor from either Intel or NEC.

Head positioning is done with a dc motor via a gear train to a plastic rack that rides on top of the main head support shaft. Head position information is provided by a home sensor and a ten pole magnet/hall effect sensor combination. The magnet is turned ten revolutions per inch of head travel, giving head position accurate to 1/100 of an inch. The home sensor is made up of another hall effect device which senses when the head carriage moves a magnet away from it.

The paper feed mechanism is stepper motor/belt driven. This printer is one of the low-cost printers that can take single sheet, roll or fanfold paper. Paper widths of up to 9½ inches (fanfold) can be accommodated. Paper positioning allows both forward and reverse paper motion, providing super- and subscript capability.

The printer can perform a top of form for form lengths of 11½ inches (U.S.) or 12 inches for international models. The form length cannot be programmed or changed by the user.

We Have It!

FOLLOW THE STAR
NorthStar™

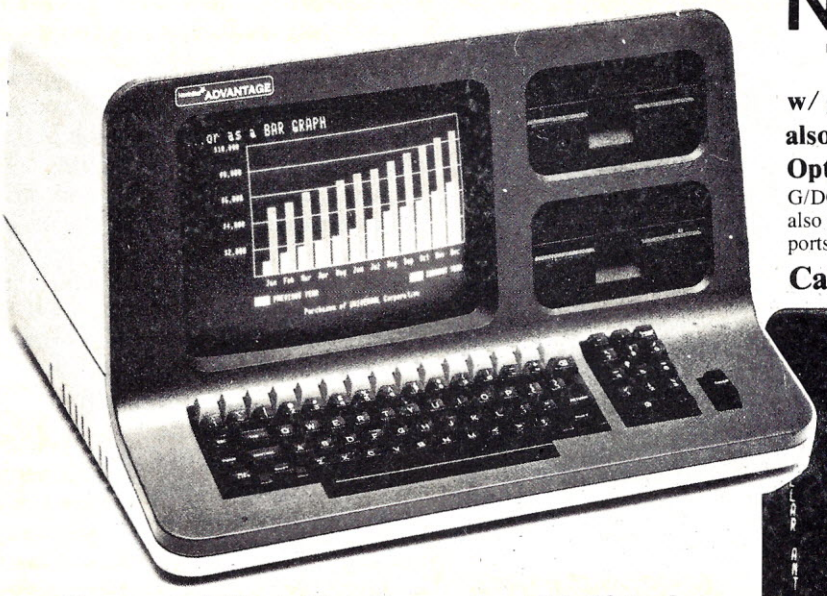
The New ADVANTAGE

w/ graphics running in seperate 20K of RAM; also includes 2K Boot Strap ROM.

Optional operating systems.

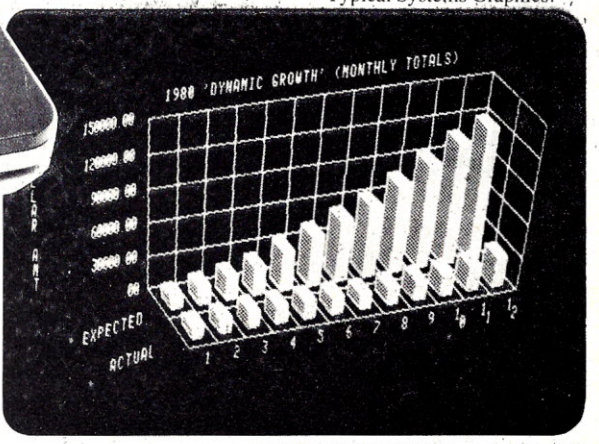
G/DOS runs existing NorthStar programs; Graphics C/PM® also runs conventional NorthStar C/PM® programs. Serial ports and parallel ports are available as options.

Call for prices.



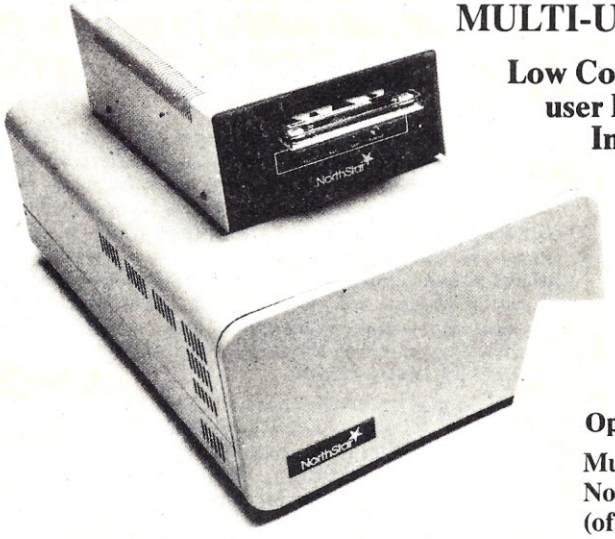
Integrated Desk Top Computer with 12 inch Bit-Mapped Graphics or Character Display, 64Kb RAM, 4 MHz Z80A,® Two Quad Capacity Floppy Disk Drives, Selectric® Style 87 Key Keyboard, Business Graphics Software

Typical Systems Graphics:



3-DIMENSIONAL CHART

MULTI-USER HORIZON SYSTEMS



Low Cost, Packaged, High Performance, Multi-user HORIZON® systems with 5Mb or 18Mb Integrated Winchester Hard Disks, Up to Five Users.

HRZ-IQ-64K-HD5
w/5 Megabyte Winchester ..... $4749★

Four-User HORIZON 1Q-64K-18H
w/ 18Mg Hard Disk. only $8260★

★ *To May 30, 1982*

Optional Operating Systems.

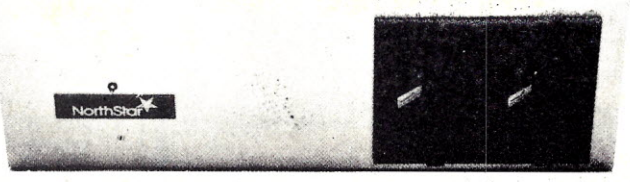
Multi-user operating systems now available to run both NorthStar DOS/BASIC and standard C/PM programs (offers more available RAM than an MP/M system)

HORIZON 2Q-64K, $2896★
(with metal case)

H RAM 64K Memory Board, $595★

★ *To May 30, 1982*

All prices, F.O.B. shipping point, subject to change. All offers subject to withdrawl without notice. Advertised prices reflect a 2% cash discount (order prepaid prior to shipment). C.O.D.'s and credit card orders are 2% higher.



238

MiniMicroMart, Inc.

943 W. Genesee St. **Syracuse, N.Y. 13220 (315) 422-4467 TWX 710-542-0431**

See List of Advertisers on page 130

The ribbon is driven by a small ac motor and is stored in a stuffer box molded into the top cover. Since a separate cover for the ribbon was not provided, the user must never tip the printer upside down when the printer lid is removed or the ribbon will dump out of the printer and onto the floor. The ribbon is fed with a half twist to form a mobius loop, allowing both sides of it to be used.

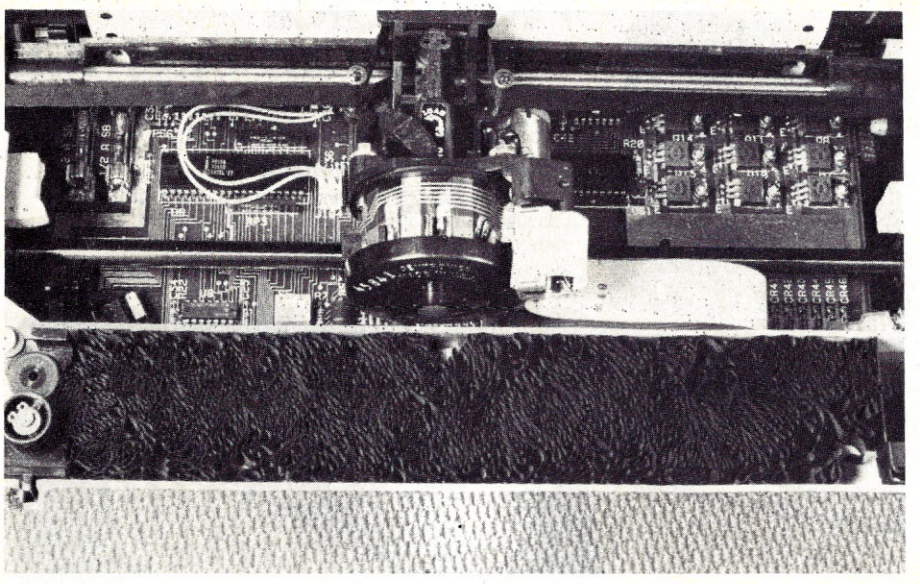


Photo 2. The view of the printer innards with the top cover removed. Shown here from front to back is the acoustic foam along the front edge, the ribbon in the integral stuffer box, the head and head rail and plastic rack, the front head rail and finally the paper. The two fuses visible in the top left corner are for ±17 volts fed to the interface connector and are not used by the printer. I recommend that they be removed to eliminate possible electrical problems on the interface when ±17 power is not used there.

Printer Features

Character sets. The Centronics 739 offers character pitches of ten and 16.7 characters per inch, and two unique fonts. (A font is a set of type in one size and face; e.g., gothic, roman or italic. A character set is the list of characters that can be printed.)

One font is used for ten and 16.7 cpi monospaced print, and the other for ten cpi proportionally spaced print. Monospaced print quality is poorer since fewer dots are used to make up the characters, the horizontal dots do not overlap as much and the lowercase descenders only go one dot below the baseline.

The proportional font offers attractive, clear print using overlapping dots. Characters are formed by dots nine high by six to 18 wide, depending on the character. The number of characters printed per inch in this mode varies according to the width of the characters printed, but the character size is about the same as that printed in ten cpi monospaced.

OSI COMPATIBLE HARDWARE

IO-CA10X SERIAL PORT $125
ACIA based RS-232 serial printer port. DIP SWITCH selectable baud rates of 300-9600. Handshaking (CTS) input line is provided to signal the computer when the printer buffer is full. Compatible with OS-65U V1.2 and OS-65D.

IO-CA9 PARALLEL PORT $175
Centronics Standard Parallel printer interface for OSI computers. The card comes complete with 10 ft. of flat ribbon cable. Compatible with OS-65D and OS-65U software.

IO-CA9D DIABLO PARALLEL PORT $175
DIABLO 12 BIT WORD Parallel port for use with word processor type printers. Complete with 10 ft. cable. Compatible with OS-65U software.

IO-LEVEL 3 MULTI-USER EXPANSION $450
Provides 3 printer interfaces currently supported by OSI-Serial, Centronics Parallel, Diablo Parallel. 4K of memory at D000 for Multi-user executive. 4 Port serial cluster. The LEVEL 3 card allows expansion of an OSI C3 machine up to 4 users with appropriate additional memory partitions.

24MEM-CM9...$380 **16MEM-CM9...$300** **8 MEM-CM9...$210**
24K memory card is available at 3 different populated levels. All cards are fully socketed for 24K of memory. The card uses 2114-300ns chips. DIP SWITCH addressing is provided in the form of one 16K block and one 8K block. Also supports DIP SWITCH memory partition addressing for use in multi-user systems.

FL470 FLOPPY DISK CONTROLLER $180
OSI-Type floppy disk controller and real time clock. Will Support 5¼" or 8", Single or double-sided drives. Requires drives with separated data and clock outputs.

BIO-1600 BARE IO CARD $50
Super 1/O Card. Supports 8K of 2114 memory in two DIP SWITCH addressable 4K blocks, 2 16 Bit Parallel Ports may be used as printer interfaces, 5 RS-232 Serial Ports with CTS & RTS handshaking. With manual and Molex connectors.

BMEM-CM9 BARE MEMORY CARD $50
Bare 24K memory card, also supports OSI-type real time clock and floppy disk controller. With manual and Molex connectors.

#96 PROTOTYPE CARD $35
Prototype board holds 96 14 or 16 pin IC's. Will also accommodate 18, 24, or 40 pin IC's. Row and column zone markings, easy layout. 1/16" epoxy glass P.C. board.

C1P-EXP EXPANSION INTERFACE $65
Expansion for C1P 600 or 610 boards to the OSI 48 Pin Buss. Uses expansion socket and interface circuitry to expand to 48 Pin Backplane. Requires one slot in backplane.

BP-580 BACKPLANE $47
Assembled 8-slot backplane with male Molex connectors and termination resistors.

DSK-SW DISK SWITCH $29
A circuit when added to OSI Minifloppy systems extends the life of drives and media. Accomplish this by shutting off Minifloppy Spindle motor when system is not accessing the drive. Complete KIT and manual.

D&N MICRO PRODUCTS, INC. ↙293
3684 N. Wells Street Ft. Wayne, Indiana 46808
219/485-6414
TERMS: Check or money order Add $2 Shipping, Outside U.S. add 10%.

MICROSTAT™ Release 2.0

NEW RELEASE! **Just some of the new features of Microstat Rel. 2.0 include: new programs for moments about the mean, skewness, kurtosis and stepwise multiple regression, longer file names, faster sort routine, the ability to declare each data file's numeric precision and drive location plus an expanded user's manual with new appendices for the equations and file structures used in Microstat. Also included is a Data Management Subsystem for file maintenance (edit, list, destroy, augment, sort, rank-order, move and merge) plus transformations (add, subtract, multiply, divide, reciprocal, log, natural log and antilog, exponentiation and linear) that allow you to create new variables from existing variables.**

After file creation with DMS, programs for analysis include: Descriptive statistics, Hypothesis testing (mean and proportion), ANOVA (one-way, two-way, and random blocks), Scatterplots, Frequency distributions, Correlation analysis, Simple, Multiple and Stepwise Multiple Regression (including files larger than available memory), Time series, 11 Nonparametric tests, 8 Probability distributions, Crosstabs and Chi-square, Combinations, Permutations and Factorials (up to one million factorial). All program output is neatly formatted for easy use.

The price for Microstat Rel. 2.0 is $295.00 and the user's manual is available for $25.00 (credited towards purchase) and includes sample printouts with file lables that reference standard statistical texts and journals so you can compare the results from Microstat to those produced on much larger systems. Compare Microstat to any other package on the market and we think you'll agree that Microstat is the best at any price.

ECOSOFT, INC. ↙82
P.O. BOX 68602
INDIANAPOLIS, IN 46268-0602
(317) 283-8883

master charge THE INTERBANK CARD VISA®

Both fonts can be printed double-width (by printing each dot twice) and underlined.

Five foreign-character sets are available. These include French, English, German, Italian and Swedish/Finnish. Up to 12 U.S. ASCII characters are replaced with a European character. The character sets are switch-selected and cannot be changed via software.

Graphics. This printer provides graphics with a dot pattern of 72 dots/inch vertical by 70 horizontal. The dot pattern overlaps so it is possible to print a totally black image. Dot position accuracy is stated to be within one-half of a dot.

The graphics mode is selected by an escape sequence (described later). Graphics characters in this printer are organized starting at CHR$(32) and extend to CHR$(95). Each pass of the printhead covers six rows of graphics dots. Each pin in the head is controlled by a single bit in the graphics characters sent to the printer; the dot to bit mapping is typical of other printers with dot graphics, except that the graphics values here are offset by 32 to allow direct control code operation while in the graphics mode. The printer automatically changes the amount of paper moved during a linefeed to make successive passes of graphics data abut, eliminating the need for a

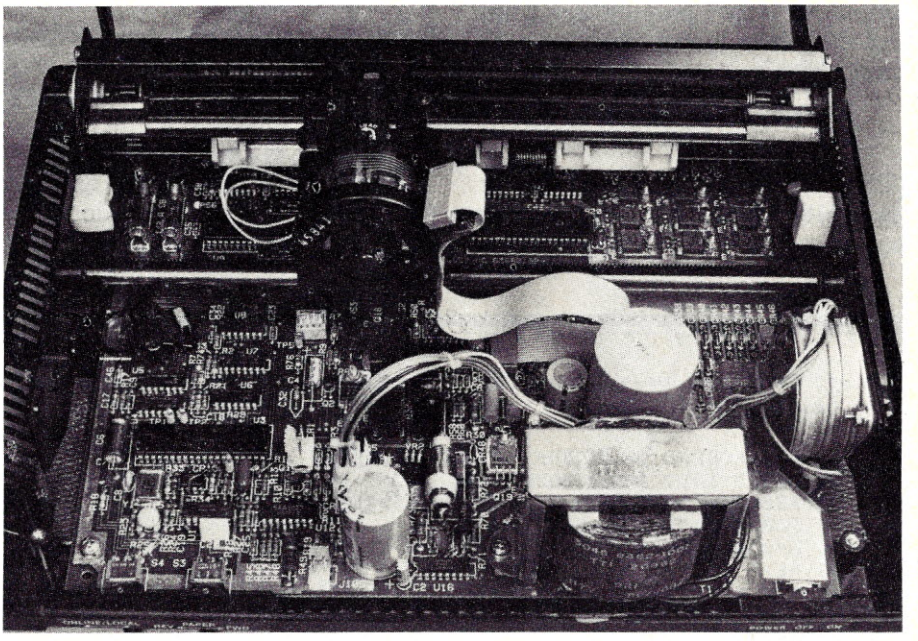
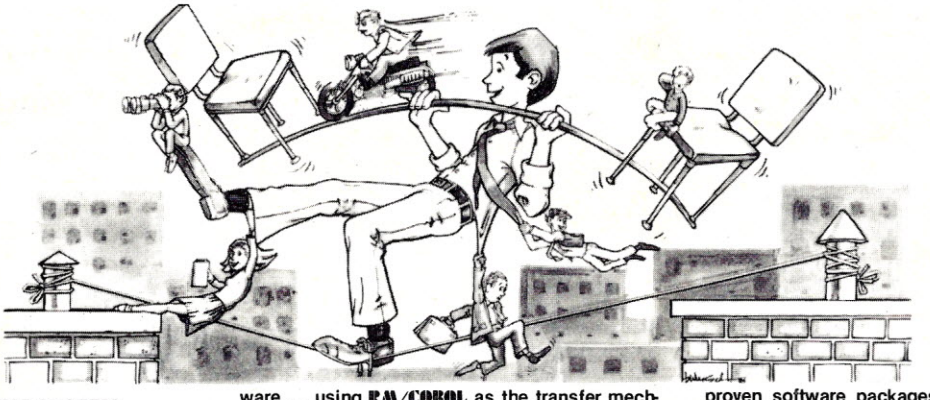


Photo 3. The printer with the entire case removed. The primary fuse, with a plastic cover, is visible to left of the paper feed motor. The printer option DIP switch is located on the left side and below the head as it is positioned in this photograph. The switching power supply inductor that causes the objectionable buzz is visible to the left and slightly above the power transformer. Coating it with GE Bathtub Seal will help quiet it.

RM/COBOL™[1] MAKES IT ACROSS!



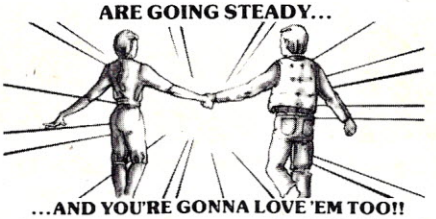
...FROM ONE OPERATING SYSTEM TO ANOTHER!
A VITAL WAY TO PROTECT YOUR SOFTWARE INVESTMENT FOR THE FUTURE!!

The **RM/COBOL** language runs on more different Operating Systems and more different-sized computers than any other similar language. For starters, it runs on NCR and TI minicomputers and, in the micro field, on the CP/M[2], MP/M[2], CP/M-86[2], MP/M-86[2], TRSDOS[3], OASIS[4], MOASIS[4], and UNIX[5], (ONYX version) Operating Systems ... to mention only a few.

Until now, serious business software of the scope and flexibility seen in the minicomputer world has not been available on micros. **RM/COBOL** now allows transfer of such software with a minimum of fuss.

We have participated in such a mini-to-micro transfer of a major set of general business software ... using **RM/COBOL** as the transfer mechanism, of course. Running on literally thousands of minicomputers, these refined, enhanced, and proven software packages cover A/R, A/P, G/L, P/R. Order Entry (with Invoicing and Inventory Control) as well as Sales Analysis. The Packages define a new level of achievement for features and flexibility in micro applications software and offer top quality at a reasonable price.

RM/COBOL and CRT![TM6] from CYBERNETICS ARE GOING STEADY...



...AND YOU'RE GONNA LOVE 'EM TOO!!

Use your computer to program itself. **CRT!** (Cobol Reprogramming Tool!) from cybernetics is a program generator for **RM/COBOL** that produces error-free **RM/COBOL** source programs for data input, file maintenance, and report printing programs.

A full feature interactive program generator, not a subset! Call Now! 714/848-1922.

For immediate information, call 714/848-1922 for your complete product description.

Trademarks of:
1-Ryan—McFarland Corp.; 2-Digital Research, Inc.; 3-Tandy Corp.; 4-Phase One Systems, Inc.; 5-Bell Telephone Laboratories, Inc.; 6-Cybernetics, Inc.

CYBERNETICS INC

8041 NEWMAN AVE., SUITE 208
HUNTINGTON BEACH, CA 92647
714/848-1922

special graphics line feed control character.

Print characteristics. The printer modes are selected by a two or three character escape sequence. For example, to select proportional printing, the printer is sent the string (written in Basic):

```
PRINT CHR$(27);CHR$(17)
```

(CHR$(27) is the escape character, and CHR$(17) is the control character selecting proportional printing.) Graphics mode is selected by a three character sequence:

```
PRINT CHR$(27);"%0";
```

Control codes recognized directly by the printer, regardless of mode, are line feed, carriage return, form feed, start underline (CHR$(17)), stop underline (CHR$(18)) and backspace (CHR$(8)).

Backspace is a special case where a decimal number between 1 and 126 specifying the number of dot positions to be backspaced must be sent after the backspace control code. Forward dot spacing can also be performed, but is controlled with six different escape sequences.

Manual. The manual for this printer consists of 32 pages. It covers operation and user maintenance of the printer in such a manner that it has to be explained in the commentary section of this review.

Tests. I ran the printer with a series of programs to provide print samples and to measure the actual printer throughput. The print samples are given in Listing 1 and the printer throughput is listed in Table 1. I used the printer for about ten hours and found no malfunctions, printer anomalies or failures. Operation was completely predictable based on information found in the manual.

Listing 2. This program was used to produce the print samples shown in Fig. 1 on my TRS-80, Model I. Both listings were printed with the 739.

```
1 REM PROGRAM TO PRODUCE PRINT SAMPLES
10 CLEAR 1000 : REM MAKE SOME ROOM FOR STRINGS
20 REM GENERATE A TEST PATTERN STRING
30 FOR N=33 TO 96
40 A$=A$+CHR$(N)
50 NEXT N
60 FOR N=N TO 127
70 B$=B$+CHR$(N)
80 NEXT N
90 REM A$ WILL PRINT UPPER CASE, B$ WILL PRINT LOWER CASE
100 REM PUT PRINTER IN 10 CPI MONOCASE MODE
110 LPRINT CHR$(27);CHR$(19)
```

More

A Subjective Analysis

This, the final section of my review, is where my personal bias and preferences may cloud reality as seen by others. I can only say that these comments are based on 15 years of experience in the computing field, a period of time sufficient to build up considerable prejudice and

ADVENTURES!!!

16 K COLOR 80 or 8KOS1. These Adventures are written in BASIC, are full featured, fast action, full plotted adventures that take 30-50 hours to play. (Adventures are interactive fantasies. It's like reading a book except that you are the main character as you give the computer commands like "Look in the Coffin" and "Light the torch.") $14.95 each.

ESCAPE FROM MARS (by Rodger Olsen)

This ADVENTURE takes place on the RED PLANET. You'll have to explore a Martian city and deal with possibly hostile aliens to survive this one. A good first adventure.

PYRAMID (by Rodger Olsen)

This is our most challenging ADVENTURE. It is a treasure hunt in a pyramid full of problems. Exciting and tough!

OS1 only TINY COMPILER OS1 only

The easy way to speed in your programs. The tiny compiler lets you write and debug your program in Basic and then automatically compiles a Machine Code version that runs from 50-150 times faster. The tiny compiler generates relocatable, native, transportable machine code that can be run on any 6502 system.

It does have some limitations. It is memory hungry — 8K is the minimum sized system that can run the Compiler. It also handles only a limited subset of Basic — about 20 keywords including FOR, NEXT, IF THEN, GOSUB, GOTO, RETURN, END, STOP, USR(X), PEEK, POKE, -, =, *, /, , <,> , Variable names A-Z, and Integer Numbers from 0-64K.

TINY COMPILER is written in Basic. It can be modified and augmented by the user. It comes with a 20 page manual.

TINY COMPILER—$19.95 on tape or disk. OS1.

QUEST

QUEST — A NEW IDEA IN ADVENTURE GAMES! Different from all the others. Quest is played on a computer generated map of Alesia. Your job is to gather men and supplies by combat, bargaining, exploration of ruins and temples and outright banditry. When your force is strong enough, you attack the Citadel of Moorlock in a life or death battle to the finish. Playable in 2 to 5 hours, this one is different every time.

16K COLOR-80 OR TRS-80 or 12KOS1. $14.95.

ARCADE AND THINKING GAMES
16K COLOR 80 or 8KOS1

TIME TREK, REAL TIME REAL GRAPHICS TREK. See the torpedoes fly and Klingons explode. No more scolling displays, no more turn taking. — This one has real time and real displays. In BASIC — for 16K level II or extended color BASIC. $14.95.

SPACE ZAPPER. Protect your central starbase from alien ships by zapping them first. High res, high speed graphics, right out of the arcades. $14.95 — 16K Extended or 32K Disk Basic for Color 80 ONLY!

BATTLEFLEET — This grown-up version of Battleship is the toughest thinking game available on 80 computers. There is no luck involved as you seek out the 80's hidden fleet. This is a topographical toughie. $9.95.

SLASHBALL — A two player game of strategy and skill, this is like nothing you have ever seen before. This takes fast fingers, quick wits and concentration. Playable from age 6 to 65, it is a good family game. $9.95.

LABYRINTH — 8K OS1 or 16K EXTENDED COLOR BASIC — With amazing 3D graphics, you fight your way through a maze facing real time monsters. The graphics are real enough to cause claustrophobia. The most realistic game that I have ever seen on either system. $14.95.

Please specify system on all orders

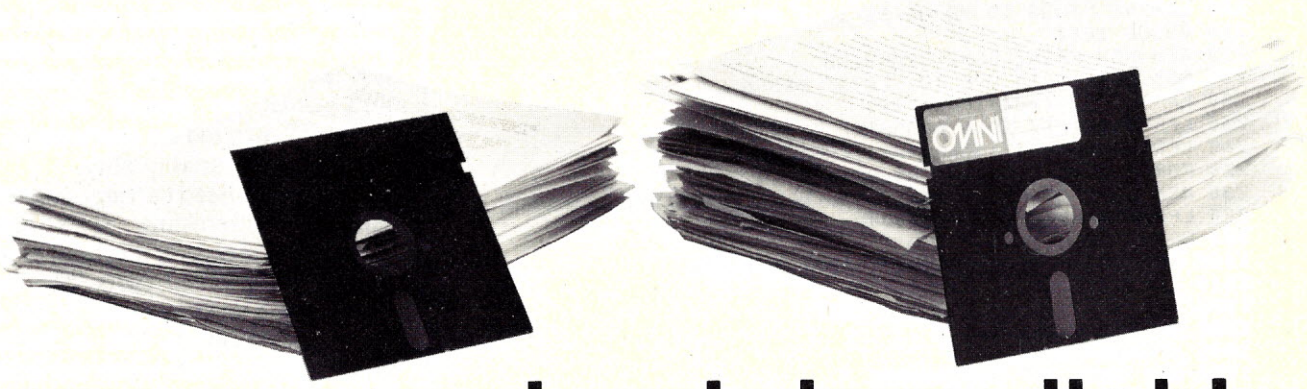
This is only a partial listing of what we have to offer. We have arcade and thinking games, utilities and business programs for the OS1 and TRS-80 Color. We add new programs every week. Send $1.00 for our complete catalog.

AARDVARK - 80 ~91

OS1 **2352 S. Commerce, Walled Lake, MI 48088** **TRS 80 COLOR**

(313) 669-3110

Double your disk storage capacity...



simply by switching to Omni's new reversible disk.

If you have an Apple, TRS-80, Zenith, North Star or any other single-sided 5¼" disk drive, you can double disk capacity by simply switching to the Flip/Floppy disk from Omni. It works just like your present disks, except you can flip it over and record on the reverse side. So you can consolidate programs and files that used to require two disks. You can halve your disk requirements. And save money.

Each disk comes with some impressive specifications: They're certified error-free at more than twice the error-threshold of your system. Rated for more than 12 million passes without disk-related errors or significant wear. And precision fabricated with such standard features as reinforced hub rings.

Call Omni toll-free today. Get premium disks. Twice the capacity. A full money-back guarantee. Unbeatable price. And if you order a ten pack now, a free $5.00 storage case as well.

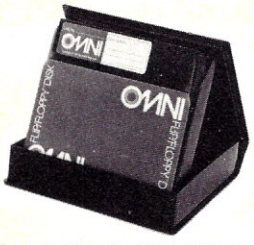
OMNI

Omni Resources ↙310
4 Oak Pond Avenue, Millbury, MA 01527
(800) 343-7620 In Mass. (617) 799-0197

Dealer inquiries invited.
Software Houses: We also offer duplicating and formatting services.

Free Offer!

If you order now, you'll get a free, protective plastic library case with each 10 pack.
Order today. Get the library case and great prices on premium disks.



Order toll-free (800) 343-7620.
In Mass. (617) 799-0197.

Send the following Flip/Floppy disks.
I understand they have a full 90 day money-back guarantee if I'm not completely satisfied.

System & model # _____

____ Ten packs @ $40.00* $_____
(Each equivalent to 20 single-sided disks)
*Includes plastic case

Shipping and handling $ 1.50
5% sales tax (Mass. only) $_____
Total $_____

____ Check (to Omni Resources) ____ C.O.D.
____ Master Card ____ Visa

Card #_____ Exp._____
Name _____
Address _____
_____
Tel _____

↙See List of Advertisers on page 130

Listing 2 continued.

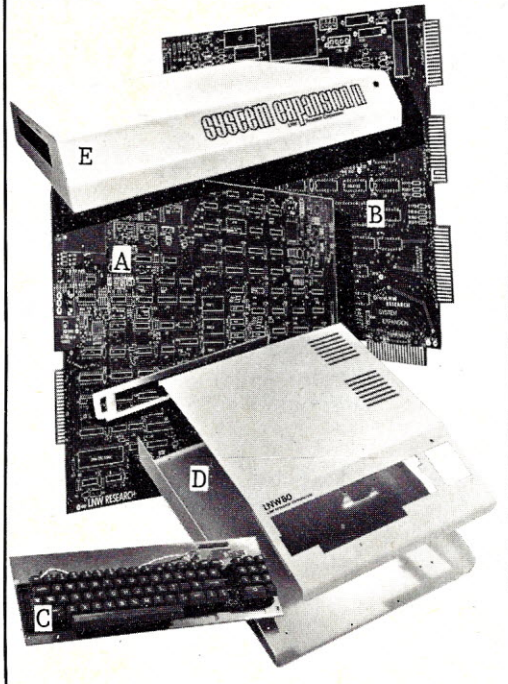
```
120 LPRINT "THIS IS MONOCASE 10 CPI"
130 GOSUB 1000
140 REM PUT PRINTER INTO 10 CPI PROPORTIONAL MODE
150 LPRINT CHR$(27);CHR$(17)
160 LPRINT "THIS IS PROPORTIONAL 10 CPI"
170 GOSUB 1000
180 REM PUT PRINTER INTO 16.7 CPI MONOCASE
190 LPRINT CHR$(27);CHR$(20)
200 LPRINT "THIS IS MONOCASE 16.7 CPI"
210 GOSUB 1000
220 REM NOW PRINT SOME GRAPHICS
230 REM SELECT 10 CPI TO  PRINT MESSAGE
240 LPRINT CHR$(27);CHR$(19)
250 LPRINT "THIS IS A GRAPHICS TEST"
260 LPRINT CHR$(27);CHR$(37);CHR$(48);
270 FOR N=1 TO 5:LPRINT A$+B$:NEXT N
280 REM EXIT GRAPHICS MODE WITH A VALID ESCAPE SEQUENCE
290 LPRINT CHR$(27);CHR$(19)
300 PRINT:PRINT:PRINT:END
1000 REM SUBROUTINE TO PRINT TEST PATTERN
1010 LPRINT A$+B$
1020 REM NOW UNDERSCORE THE TEXT
1030 LPRINT CHR$(15);
1040 LPRINT A$+B$
1050 REM TURN OFF UNDERSCORE
1060 LPRINT CHR$(14);
1070 REM PRINT DOUBLE WIDTH
1080 LPRINT CHR$(27);CHR$(14);
1090 C$=A$+B$
1100 LPRINT CHR$(27);CHR$(14);
1110 LPRINT LEFT$(C$,39)
1115 LPRINT CHR$(27);CHR$(14);
1120 LPRINT MID$(C$,40,39)
1130 LPRINT CHR$(27);CHR$(14);
1140 LPRINT RIGHT$(C$,17)
1150 RETURN
```

onesided judgment. If you think I'm being unfair, unjust or petty, let your voice be heard; the letter column of this magazine is an open forum for complaints.

Assembly, material quality, mechanical design. The 739 is obviously a light-duty machine, but I found that overall the mechanical design is very good. The design is such that assembly, as organized on a production line, must be simple and fairly foolproof. I found no shortcuts in assembly or material quality.

I found the head carriage assembly especially interesting. It is highly tooled, meaning that it is built of a lot of injection-molded parts. The head servo drive system uses a dc toy motor and sounds like a battery-driven electric train when the head is being positioned. (Engineers on the project told me life tests indicate that the motor will outlast the head, but could be destroyed by continuously printing very short lines.) The plastic rack that rides on top of the head support rail is designed to fail if the head is severely jammed. This protects the motor from stall currents and leaves the gear train in one piece; the only

COMPUTER KITS – FROM $69.95



LNW SEMI-KITS can save you hundreds of dollars. By obtaining your own parts at the lowest possible cost and assembling the **LNW SEMI-KITS,** you can have the most highly acclaimed microcomputer in the industry – the **LNW80.** The **LNW SEMI-KITS** are affordable modules. You can start with a modest cassette system and expand to a full 4Mhz TRS-80 compatible system with 5 or 8 inch double density disks and color at any time.

A. LNW80 CPU – Made of high quality FR4 glass epoxy double sided circuit material, with plated-through holes and gold edge connector. It is fully solder-masked and silk screened. Here are just some of the outstanding features you will have when your **LNW80** CPU board is fully assembled: • 16K RAM • Color and black and white video • 480 x 192 high resolution graphics • 64 and 80 column video • 4 Mhz Z80A CPU • Upper and lower case display • 500 and 1000 baud cassette I/O –**$89.95**

B. SYSTEM EXPANSION – Expand the **LNW80** computer board, **TRS-80** and **PMC-80** computer with the following features: • 32K memory • Serial RS232C and 20Ma port • Real time clock • Parallel printer port • 5 inch single density disk controller • Expansion bus (screen printer port) • Onboard power supply • Solder-masked and silk screened legend – **$69.95** (tin plated contacts) – **$84.95** (gold plated contacts)

C. KEYBOARD – 74 key expanded professional keyboard – includes 12 key numeric keypad. Fully assembled and tested. – **$99.95**

D. COMPUTER CASE – This stylish instrument-quality solid steel case and hardware kit gives your **LNW80** that professional factory-built appearance. – **$84.95** Add $12.00 for shipping.

E. SYSTEM EXPANSION CASE – This stylish instrument-quality solid steel case and hardware kit gives your **SYSTEM EXPANSION** interface that professional factory-built appearance. – **$59.95** Add $10.00 for shipping.

F. LNW80 CPU – HARD TO FIND PARTS KIT – **$82.00**

G. LNW80 VIDEO – HARD TO FIND PARTS KIT – **$31.00**

H. SYSTEM EXPANSION – HARD TO FIND PARTS KIT – **$27.50**

I. LEVEL II ROM set. (6 chip set) – **$120.00**

VISA and **MasterCard** accepted. Add $3.00 for shipping plus $1.00 for each additional item. All shipments via UPS surface. Add $2.00 for U.S. Mail. Shipments outside continental U.S.: funds must be U.S. dollars. Sufficient shipping costs must be included with payment.

ORDERS & INFORMATION – (714) 544-5744
SERVICE – (714) 641-8850

LNW Research Corp.

2620 WALNUT Tustin, CA. 92680

198

Give Your TRS-80* a Tremendous Boost with RACET COMPUTES Software

RACET COMPUTES Utility Software makes the TRS faster, more efficient, and easier to use. Our programming aids improve your productivity. Our reputation is for products that are professional in design and work as advertised!!!

FIELD PROVEN HARD DISK DRIVES AND OPERATING SYSTEM

Now you can use RACET's Hard/Soft Disk Operating System (HSDS) with the ARM Winchester Disk Drive on the Model II. This cost effective combination provides 15 Megabytes per drive **including ECC Error Correction Code** and an advanced sequencer to further ensure data integrity. An incremental backup to floppy is provided so that only those **sectors** that were changed from the last backup are saved. A full monthly service contract is available at $30 per month per drive.

The HSDS Software has more than One Year's FIELD Experience. The latest HSDS version adds several enhancements including maintenance of system files on the hard drive, files as large as the disk, the ability to segment the disk as logical drives, definable directory size, and many utilities including bulk copies between floppy and hard drives, multiple purge, Superzap, and Directory Catalog System. Full program compatibility with TRSDOS 2.0a is maintained. Mixed floppy and hard drive operation is supported.

HSDS is available for the Cameo, Cynthia Bull, Corvus, Data Peripherals, and Santa Clara Systems hard disk systems as well as the ARM Winchester Drive.

ARM 15 Megabyte Drive Subsystem $3895. HSDS Software $400.
Cameo 5/5 Cartridge Drive $5995. Cynthia Bull 10/10 Drive $7995

NEW PRODUCT ★ Model II Fast Backup Utility ★ $75

5 to 10 times faster backups!!! Full disk backup (including verify) 55 **seconds!!!** on two drive system — 2:15 on single drive system. In business, time is money, and one BACKUP is worth 1000 tears!!

NEW PRODUCT ★ INTEGRATED BUSINESS SYSTEM ★

ISAM File Structure — Multi-Company Capability. Modular structure. Each module includes complete user documentation which guides the user through installation and allows "practice" using a sample data base. When ready, the user simply names his data base and begins. The Integrated Business System program set includes General Ledger, Accounts Receivable, Accounts Payable, Payroll, Inventory, General Journal, Asset Management and more.

Business Programs $250/module Mod III, $300/module Mod II, $795 for all four Mod III, $995 for all four Mod II. General Ledger and Accounts Receivable available now. Accounts Payable and Payroll 1st Quarter 1982.

RACET COMPUTES LTD. ↙101
1330 N. GLASSELL, SUITE M, ORANGE, CA 92667

CIRCLE READER RESPONSE BELOW FOR FREE CATALOG

CHECK, VISA, M/C, C.O.D., PURCHASE ORDER
TELEPHONE ORDERS ACCEPTED (714) 997-4950

*TRS-80 IS A REGISTERED TRADEMARK OF TANDY CORPORATION

NEW
40 TRACK
DISK DRIVES
with
POWER SUPPLY & CASE
for
RADIO SHACK
and
OTHER COMPUTERS

☞ $169.00 ☜

OMNITEK Computers
International, Inc. ↙140

LIMITED SUPPLY

1899 Main Street
Tewksbury, MA 01876
(617) 851-4580

LIMITED SUPPLY

Shipping extra FOB Tewksbury
Master Card, Visa, or Bank Checks accepted

Micro Resources Corporation introduces:

MR EDit

The Intelligent workhorse of CP/M and MP/M compatible video text editors

- Written by experienced professionals
- An extremely powerful and versatile tool for the professional software developer and the serious hobbyist
- All of the advanced video editing functions that you would expect (and some that you wouldn't)
- Allows you to custom configure the keys on your terminal to match your needs
- Complete with extensive documentation

MR EDit is the necessary addition to your stable of thoroughbred software. Where power and versatility are important to your efforts, MR EDit outperforms other hayburners costing 50% to 70% more.

SPECIAL PRICE—only $90.00.

Manual is available separately for $15.00 which is refundable with purchase of software. (Tenn. residents add 6.75% sales tax)

Visa and Mastercard welcome: Send account number and expiration date.

Order today by letting us know your CRT type and the disk format desired.
(8" single density CP/M or 5¼" soft sectored formats)

Micro Resources Corporation ↙68
6922 Harding Road Suite 117-G
Nashville, Tennessee 37221

Dealer inquiries welcome.

CP/M and MP/M are registered trademarks of Digital Research, Inc.

'68' MICRO JOURNAL ™

6800-6809-68000

★ The only ALL **68XX** Computer Magazine

USA
1 YR.—$24.50 2 Yr.—$42.50 3 Yr.—$64.50
*Foreign Surface Add $12 Yr. to USA Price
Foreign Air Mail Add $35 Yr. to USA Price
*Canada & Mexico Add $5.50 Yr. to USA Price

OK, PLEASE ENTER MY SUBSCRIPTION
Bill my: M/C ☐ — VISA ☐

Card # _____
Expiration Date _____
For ☐ 1-Yr. ☐ 2 Yrs. ☐ 3 Yrs.
Enclosed: $ _____
Name _____
Street _____
City _____
State _____ Zip _____

68 Micro Journal ↙132
5900 Cassandra Smith Rd.
Hixson, TN 37343

↙See List of Advertisers on page 130

problem the user will have is buying a replacement.

I did not like the open ribbon storage compartment when I saw it, and less after I dumped the ribbon while positioning the printer for photographs. Users might like to tape a piece of cardboard over the ribbon compartment to prevent this. I understand that a plastic cover to prevent premature ribbon unloading may be furnished with printers manufactured in the near future.

I liked the print quality of this printer. It is among the best in its class. All dots are completely formed and the paper is never smudged. I liked the crisp font designs, but was disappointed to find that they cannot be randomly mixed on a single line. (Printer line control gets messed up if you do this. The manual specifically warns against mixing ten cpi monospaced characters with either proportional or 16.7 cpi characters.)

I was also disappointed that the proportional mode is not usable for straight listings. The end of line must be carefully controlled by the host computer. If a line is too long, the printer will print what it can, then start the next line without regard to word boundaries. (A table of character widths is given in the manual for this purpose.)

Provisions were made for the host to control intercharacter and word spacing to allow justification. (Justification squares off either the left, right or both print margins.) This is done by use of an escape sequence to add dot spaces or the backspace sequence to remove any extra. I found it slightly amusing that there are six different commands to add one to six dot spaces, but only one backspace command to backspace up to 126 dot positions.

I liked the graphics implementation. Many other printers start graphics characters at CHR$(0), which means that control code operation is modified (usually an escape character must be embedded in the graphics text, slightly more complicated to use). The graphics dot pattern is nearly symmetrical—a circle will be squashed by about 2.8 percent. This printer offers medium graphics resolution, but is still far better than current screen dump resolutions.

Manual. The manual is not well organized, but complete and accurate. It is one of the worst features of the printer and is definitely not written with the end user in mind. The first five pages (General Information) gives operating instructions, print samples and the physical characteristics of the printer.

The Installation section (four pages) describes ribbon and paper loading procedures and the only diagram detailing character set selection and self-test operation. The actual self-test instructions (it is a multistep

Feature Summary Table
Centronics 739

Print Characteristics		
Densities (Characters/inch)	10	16.7
Double Width	Y	Y
Proportional	Y	N
Underscore	Y	Y
Justification (Host must perform all control)	Manual	N
Fonts	2	
Character Sets	1 U.S., 5 European; switch selectable, not programmable	
Line Density	6 lines per inch, fixed	
Form Lengths	11½" (U.S.), 12" (European)	
Printer Throughput	36 characters per second (10 cpi, mixed lines)	
Graphics	Dot mapped; 75 dots/inch horizontal, 72 dots/inch vertical	
Mechanical		
Ribbon	12 yard, mobius loop, ½ inch wide	
Paper Types	Single (8½ x 11) sheet, roll or fanfold	
Foot Print (Area required by printer and stack of fanfold paper on operating table)	264 sq. inches (1.83 square feet)	
Power	100 watts	
Size	14½"W x 11"D x 5"H	
Weight	12 pounds	
Interface		
Signaling	Parallel Centronics (only)	
Coding	US ASCII, 7 bit parallel	
Connector	40 pin edge connector; use 3M 3464-0001 or equal	

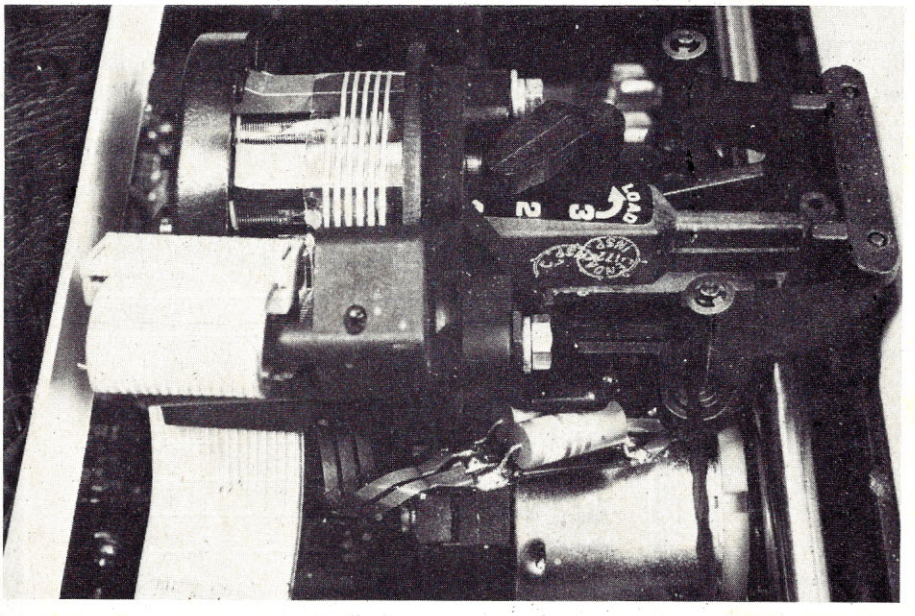
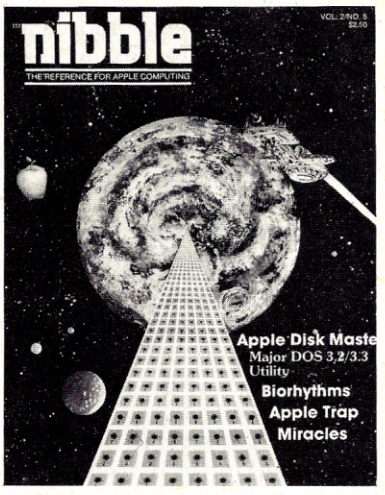


Photo 4. Close-up view of the head assembly showing the paper load lever, head solenoids and drive motor. Of all the low-cost printers, this is the only one to mount the head motor on the carriage. Notice the two noise suppression chokes located just above the dc head motor.

"NIBBLE® IS TERRIFIC" (For Your Apple)



NIBBLE IS: *The Reference for Apple computing!*

NIBBLE IS: One of the Fastest Growing Magazines in the Personal Computing Field.

NIBBLE IS: Providing Comprehensive, Useful and Instructive Programs for the Home, Small Business, and Entertainment.

NIBBLE IS: A Reference to Graphics, Games, Systems Programming Tips, Product News and Reviews, Hardware Construction Projects, and a host of other features.

NIBBLE IS: A magazine suitable for both the Beginner and the Advanced Programmer.

Each issue of NIBBLE features significant new Programs of Commercial Quality. Here's what some of our Readers say:

- *"Certainly the best magazine on the Apple II"*
- *"Programs remarkably easy to enter"*
- *"Stimulating and Informative; So much so that this is the first computer magazine I've subscribed to!"*
- *"Impressed with the quality and content."*
- *"NIBBLE IS TERRIFIC!"*

In coming issues, look for:

☐ Stocks and Commodities Charting ☐ Assembly Language Programming Column
☐ Pascal Programming Column ☐ Data Base Programs for Home and Business
☐ Personal Investment Analysis ☐ Electronic Secretary for Time Management
☐ The GIZMO Business Simulation Game

And many many more!

NIBBLE is focused completely on the Apple Computer systems.

Buy NIBBLE through your local Apple Dealer or subscribe now with the coupon below.

Try a NIBBLE!

nibble ✓286

We accept Master Charge & Visa

Box 325, Lincoln, MA. 01773 (617) 259-9710

I'll try nibble!

Enclosed is my $19.95 (for 8 issues) Price effective Jan. 1, 1982
(Outside U.S., see special note on this page.)

☐ **check** ☐ **money order**

Your subscription will begin with the next issue published after receipt of your check/money order.

Card # _____ Expires _____

Signature _____

Name _____

Address _____

City _____

State _____ Zip _____

NOTE:

- Domestic U.S. First Class subscription rate is $36.50
- Canada Air Mail subscription rate is $42.50
- Outside the U.S. and Canada Air mail subscription rate is $47.50

All payments must be in U.S. funds drawn on a U.S. bank.

©1980 by MICRO-SPARC., INC. Lincoln, Mass. 01773. All rights reserved.
*Apple is a registered trademark of Apple Computer Company.

process involving four DIP switches, the on-line/off-line and power switches) can be found in section five of the manual.

The third section, Interface Information, provides adequate electrical interface information to allow advanced hobbyists to build their own interface cable, but may be difficult for beginners to easily master. A page of character widths used by the proportional spacing font follows the electrical interface page. This section concludes with five pages of information on control code and escape sequence operation, similar to that contained in the first section of the manual.

The Operation section explains how to turn on the printer and provides helpful hints such as using a typewriter pad under the printer to quiet it (it is already fairly quiet) and cautions about dropping objects on the totally exposed controller card when the cover is open.

Section five provides maintenance information. No schematic is included.

Operation. I found the 739 to operate quietly and reliably. No paper jams or ribbon malfunctions occurred during testing. Paper loading is a general pain. I tried all three types of paper (roll, fanfold and single sheet). Universally, they didn't like to start, but once started, fed without incident.

Loading procedure runs something like this:

1. Raise cover, switch printhead to load position. (This moves the printhead back so the nose won't catch on the leading edge of the paper.)
2. Start paper in the slot for roll and fanfold, or in the single sheet feeder door for single sheets. This may include releasing the paper bail, or fumbling around in general, and is where I found the greatest difficulty.
3. After the paper is started and above the printhead, raise the cover again and reset the head to the print position.

It is true that this printer can take single sheet paper, but it is cumbersome to load. I would like to think that perhaps the unit I tested was somehow out of adjustment, but the manual did not list any possible adjustments to try. This is how I found it.

I did not like to find that the interface connector was supplied with ±17 volts. This kind of voltage does not belong on a parallel interface and especially not on an edge connector exposed to the general public. If misconnected, it will blow up your computer interface (and probably the printer as well). I suggest that you remove the two fuses pointed out in Photo 2 unless you are actually using these voltages.

I heard the buzz mentioned in product reviews of the 737 printer. It comes from an inductor in the switching power supply, pointed out in the photographs. If you hear it in the store you probably won't think much of it then. I didn't either for the first 30 minutes of use, but it will

```
10 REM TEST TO DETERMINE PRINT SPEED
15 CLEAR 1000
20 A$="THIS IS A SHORT LINE. "
30 B$="HERE IS A LINE OF MEDIUM LENGTH, 42 CHRS. "
40 C$="THIS LINE IS LONG, A FULL WIDTH LINE (WELL, ALMOST.)  IT IS THE SLOWEST O
NE. "
50 REM
55 REM INPUT FOR OPERATOR DELAY
56 INPUT Z$
60 REM
70 REM  THIS TEST IS FOR SHORT LINE PRINT SPEED - 100 LINES
80 REM
90 FOR N=1 TO 100:LPRINT A$: NEXT N
100 REM
110 REM DELAY FOR OPERATOR
120 INPUT Z$
130 REM
140 REM THIS TEST IS FOR MEDIUM LINE PRINT SPEED - 100 LINES
150 FOR N=1 TO 100:LPRINT B$:NEXT N
160 REM
170 INPUT Z$
180 REM
190 REM THIS TEST IS FOR LONG LINES - 100 LINES
200 REM
210 FOR N=1 TO 100:LPRINT  C$:  NEXT N
220 REM
225 INPUT Z$
230 REM
240 REM THIS TEST IS FOR MIXED LINE LENGTHS
250 REM
260 FOR N=1 TO 33:LPRINT A$:LPRINT B$:LPRINT C$: NEXT N
270 REM
280 REM
285 INPUT Z$
290 REM THIS TEST IS FOR RANDOM LINE LENGTHS
300 FOR N=1 TO 100
310 ON RND(3) GOTO 400,420,440
320 NEXT N
330 END
400 LPRINT A$:GOTO 320
420 LPRINT B$:GOTO 320
440 LPRINT C$:GOTO 320
```

Listing 3. This program was used to run the timing tests. Results are shown in Table 1.

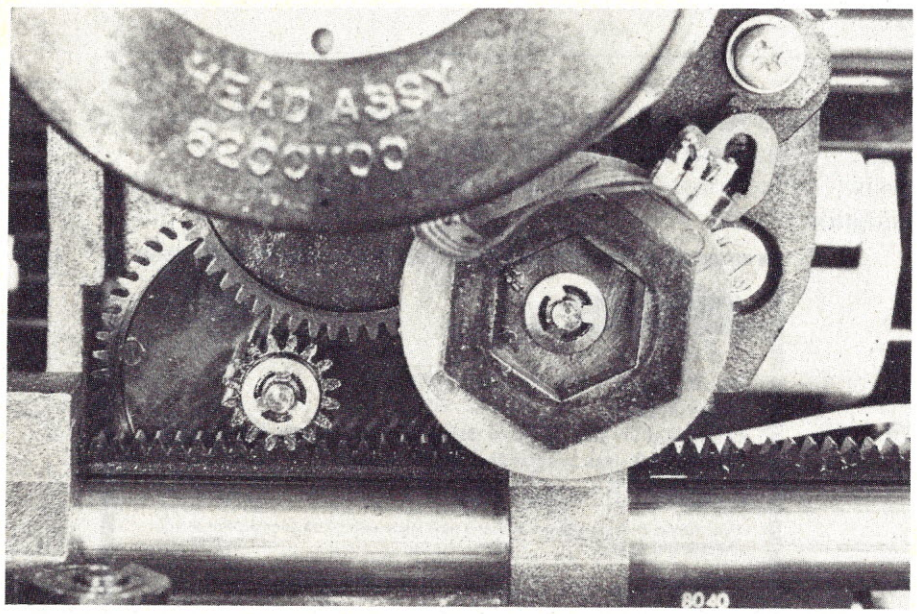


Photo 5. Close-up view of the head assembly. The plastic rack sits loosely on top of the head rail. In the event of a printer malfunction or head jam, it is sacrificed (chewed up) rather than stalling the motor or destroying other gears. The round object with the hexagon in the center is the 10 pole magnet, and at the one o'clock position above it is the hall effect sensor. The magnet spins ten revolutions for each inch of head travel. The hall effect sensor detects each magnet pole as it passes underneath, providing dot placement information to the controller in 1/100s of an inch. This design is unique in low-cost printers.

TEXAS COMPUTER SYSTEMS

We Offer Lowest Prices On

TRS-80

Model II 64k $3248

All accessories, disk expansions and software available at our low discount prices. Hard Disks in stock now! $CALL.

Model III 16k $818

48k 2 Disk RS232c $2049

Ideal system for small business use. Has full RS warranty. Plus, for limited time, with your purchase, we are offering a FREE disk of utilities, games & business software valued at $150. Call today for this special offer.

$ CALL FOR PRICES $

We offer a full line of Radio Shack computers and accessories, as well as TCS custom computers and software.
Call now for our catalog and price list!

Color Computers

4k Level 1 $308
16k Extended Basic $459
16k Extended Basic with TCS Memory $439

Other Color Computers & accessories at competitive prices. Disk Drives in stock. $CALL.

Epson Printers

The amazing EPSON printers with such standard features as 12 type fonts, removable print head, complete software control, word processor quality, TRS80 graphics, alternate character sets and parallel interface.
All printers and interfaces in stock!
If you buy elsewhere, you'll probably pay too much. Call for our low...low prices!!!

For fast, efficient service. Heart of we can air freight from Dallas

TEXAS COMPUTER SYSTEMS
P.O. Box 1327 Arlington, Texas 76004-1327 ✓328
Toll Free Number 800 433-5184
Texas Residents 817 274-5625

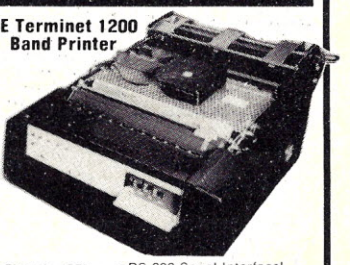
- Payment: Money order, cashiers check, certified check. Prices above reflect 3% cash discount. Call for VISA/MC prices.
- Prices subject to change any time.
- No tax out-of-state. Texans add 5%.
- Many items shipped free. Call.

Another BLOCKBUSTER BARGAIN!!

Used, Off-Lease PRINTER TERMINALS

Featuring:
- 1200 BAUD, RS-232 ASCII 96 (upper & lower case) FULLY FORMED characters at up to 120 chars./sec.! 120 columns wide!
- Typewriter quality print at Dot Matrix Speed!
- Only 9" tall, 21" wide & 25" deep, 85 lbs., 120 VAC
- 150, 300 & 1200 BAUD Serial Input Rate, Quiet Operation
- Built & Serviced *NATIONWIDE* by General Electric (GE)
- Tested and Operational!

GE Terminet 1200 Band Printer



- RS-232 Serial Interface!
- 120 CPS, 60 LPM

Current NEW price over $5000.00 each. Our Price ..... **$595.00 ea.**
Please Add $20.00 for Packaging - Shipped Truck, Freight, Collect — WITH DATA

RS-232-CABLE with female DB-25 connectors on each end. (female connector has *pins*, male has *sockets*) for interfacing the above. ..... **$19.00 ea.**

GE "Terminet" 340 BAND LINE PRINTER

Featuring:
- 230 to 340 Lines per Minute!
- Fully Formed Characters
- Parallel Input!
- Microcomputer Compatible!
- 132 Columns, 64 Characters
- Nationwide Service from GE!

IDEAL FOR MICROCOMPUTERS HIGH SPEED LINE PRINTER

These ultra-reliable, continuous-band Printers offer speeds of over 230 lines per minute, are fully operational and ready to use. Built & serviced nationwide by General Electric. Print band, schematics and data included.

115 VAC, 60Hz ..... **$895.00 ea.**
Please add $20.00 for packaging. Shipped via Truck, Freight-Collect

We Offer New and Used FLOPPY DRIVES, DISK DRIVES, PRINTERS, & MORE at BARGAIN PRICES!! Write or Call for Our Latest Flyer NOW!!!

Computer Products & Peripherals Unlimited ✓110

WAREHOUSE:
18 Granite St., Haverhill, Mass. 01830
MAIL ORDERS:
Box 204, Newton, New Hampshire 03858
TELEPHONE ORDERS
617/372-8637
Sorry, No Collect Calls
Mastercard & VISA Accepted

UV EPROM ERASER

$49.95

- ERASES ALL UV ERASABLE EPROMS (2708, 2716, 2564, etc.)
- QUICK FIFTEEN MINUTES ERASE TIME
- ERASES OVER FIFTEEN EPROMS AT A TIME
- LAMP LIFE, 7700 HOURS
- INDUSTRIAL MODEL $68.50.
- INDUSTRIAL MODEL WITH TIMER & SAFETY INTERLOCK SWITCH $97.50. *(Rugged steel enclosure with bottom drawer)*

THE BEST 6809 SINGLE BOARD COMPUTER AVAILABLE

- *Floppy Controller*
- *Printer Port*
- *RS-232 Port*
- *SWTPC compatible*
- *Runs TSC Flex*
- *Full Documentation*

PRICE: **$389.00**

FOR THE SS-50 AND S-100 BUS

ASSEMBLED, TESTED, 48 HOUR BURN-IN, 90 DAY WARRANTY

2716 EPROMS 250 ns $4.95 *DIRECT FROM FACTORY*

SS-50 6809 CPU CARD: 1MHZ **$149.00** 2MHZ **$189.00**

RS-232 INTELLIGENT EPROM PROGRAMMER $489.00
Programs: 2716, 2516, 2532, 2732, 8748, 8749

ANTISTATIC FOAM 4" x 8" **$3.95**

WE ACCEPT VISA, MASTERCARD, C.O.D., CHECKS

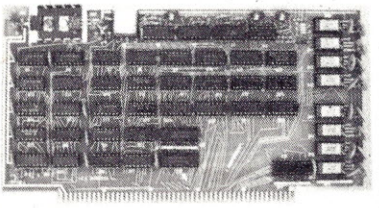
PHONE ORDERS **(305) 776-5870**
TWX: 510-955-9496 • Engineering Hot-Line: (305) 974-0967

LOGICAL DEVICES INC.
781 W. OAKLAND PARK BLVD. • FT. LAUDERDALE, FLORIDA 33311

ADD: $3.00 SHIPPING, $2.00 C.O.D. CHARGES

✓373

Super Compuprism Color Graphics



For the S-100 Bus. 32K of on board memory allows a 288 H. x 192V. dot matrix, for a total of 55,296 pixels. Every pixel is programable in any one of 16 colors or 16 grey levels completely independent of all other pixels in the matrix.

Compuprism Bare Board with documentation $45, kit $240, ass. and tested $280. (16K Memory 144H. x 192V.)

Super Compuprism Bare Board with documentation $50, kit $350, ass. and tested $395. (32K Memory 288H. x 192V.)

Add $15 to A & T price for 16 level grey scale. Add $15 to A & T price for memory management port.

Compuprism software package, includes alpanumberics, point plot, line draw, and TRS-80* graphics simulation $20 or FREE with A & T unit.

Z-80 Users You Can Use TRS-80* Software

We offer an assembled hardware interface which we guarantee will load data from TRS-80* cassettes into any Z-80 based system. (Except sealed units.) The documentation explains how to patch the TRS-80* software to your system. In fact you can virtually change your Z-80 machine into a TRS-80* without making a single hardware change. The documentation also includes an example of patching SARGON II** into a Z-80 system.

The price is $30 or FREE with the purchase of an assembled compuprism or super compuprism unit.

A-D, D-A Board

S-100 board provides 16 channels of analog to digital input and 8 channels of digital to analog output. With on board kluge area. Total cost of board and parts less than $120. Bare board with documentation $45.

ALL COD ORDERS SHIPPED WITHIN 72 HOURS. 4MHz MOD FOR S.D. SYSTEMS. EXPANDORAM $10.

J.E.S. GRAPHICS, P.O. Box 2752 Tulsa, OK 74101, (918) 742-7104

TRS-80* is a trademark of Tandy Corp.
SARGON II** is a trademark of Hayden Book Co.

✓180

✓See List of Advertisers on page 130

eventually drive you crazy. There are several solutions: 1) buy an encapsulated version of the inductor from Centronics, which I understand is now being used; 2) if this is not possible you might get some GE bathtub seal or similar product and encapsulate it yourself; or 3) turn off the printer when it is not in use.

Should you buy this product? The printer has a lot of development behind it. It started with the relatively unsuccessful 730, went to the 737 and is now available as the 739. Except for the buzz and difficult paper loading, I have no other operational complaints. It is small, light and output is easy to read as it is being printed.

If your host text outputter can control the printer in the proportional mode, you can obtain exceptional print quality. Price is $695.

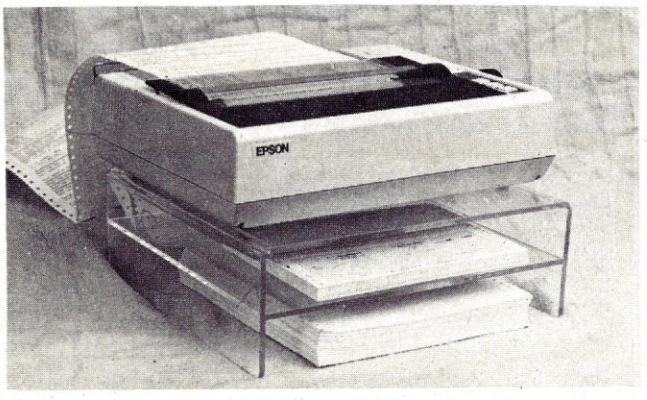
	Time for 100 lines	Characters Printed	Throughput (Characters per second)
Test 1: Short line (21 characters)	75 sec.	2100	28.00
Test 2: Medium line (42 characters)	118 sec.	4200	35.59
Test 3: Long line (75 characters)	187 sec.	7500	40.10
Test 4: Mixed lines, fixed order (Note: 99 lines used)	127 sec.	4554	35.86
Test 5: Mixed lines, random order	127 sec.	4596	36.19

Table 1. Timing tests—Tests 1, 2 and 3 ran line lengths of 21, 42 and 75 characters respectively. Test 4 ran each of the lines in a fixed order, and Test 5 printed the lines in scrambled order. Printers with logic seeking bidirectional printing should show throughput deviations on the last two tests. The 739 suffered from a relatively slow carriage return flight time and lack of bidirectional print capability. Time were measured with a sweep second hand watch; carriage returns were not counted as characters. The printer was set at 10 characters per inch, monocase for all tests.

Color Conversion Kit

Centronics has recently introduced a color conversion kit for the 739 that allows the printer to print in both black and red. The addition of color makes the 739 well-suited to display business graphics, financial and statistical analysis, sales trends and scientific functions, or to highlight important information in text.

The user can easily install this color conversion kit, which includes a Centronics red/black ribbon, new Model 739 firmware and a color shifter mechanism. Price is $75. ■



Printer Stand

End the paper mess from your desk-top printer. Paper is fed from under the printer for easy stacking. Extra shelf (SHOWN ABOVE) is available for easy forms storage.

Regular ..... (300010) $29.95
Regular w/shelf ..... (300011) $44.95
Large ..... (300020) $34.95
Large w/shelf ..... (300021) $49.95

EPSON RIBBON RELOADS

Reload your MX-70/80/100 with new Black, Red or Blue ribbon. These Silver Dollar loops are loaded into your old cartridge saving you money. Ribbons fit in both MX-70/80 and MX-100 Carts.

Black ..... (500000) ... $3.95 ea. Black ..... (500001) ... $39.50 dz.
Red ..... (500010) ... $4.95 ea. Red ..... (500011) ... $49.95 dz.
Blue ..... (500020) ... $4.95 ea. Blue ..... (500021) ... $49.95 dz.
MX-70/80 Ribbon Cartridge .... New .... (500050) ..... $10.95 ea.
MX-70/80 Ribbon Cartridge .... New .... (500051) .. 3 pk. .. $29.95 pk.

BT ENTERPRISES

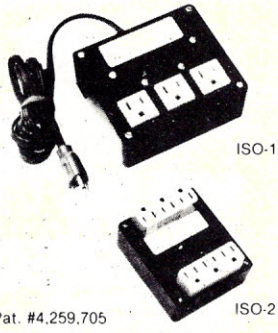
B.T. Enterprises
171 Hawkins Road
Centereach, New York
(516) 981-8568 (Voice)
(516) 588-5836 (Data)
MNET-70331, 105

VISA master charge

124 Add $2.00 S & H, NYS res. add appr. tax

DISK DRIVE WOES?
PRINTER INTERACTION?
MEMORY LOSS?
ERRATIC OPERATION?

Don't Blame The Software!



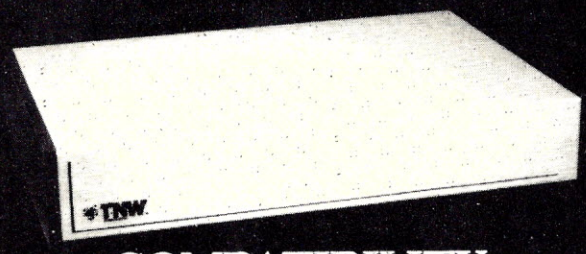
Power Line Spikes, Surges & Hash could be the culprit! Pat. #4,259,705
Floppies, printers, memory & processor often interact! Our patented ISOLATORS eliminate equipment interaction AND curb damaging Power Line Spikes, Surges and Hash. Guaranteed!

- ISOLATOR (ISO-1) 3 filter isolated 3-prong sockets; integral Surge/Spike Suppression; 1875 W Maximum load, 1 KW load any socket $69.95
- ISOLATOR (ISO-2) 2 filter isolated 3-prong socket banks; (6 sockets total); integral Spike/Surge Suppression; 1875 W Max load, 1 KW either bank $69.95
- SUPER ISOLATOR (ISO-3) similar to ISO-1 except double isolation & Suppression $104.95
- SUPER ISOLATOR (ISO-11) similar to ISO-2 except double isolation & Suppression $104.95
- MAGNUM ISOLATOR (ISO-17) 4 Quad Isolated sockets; For ULTRA-SENSITIVE Systems $181.95
- CIRCUIT BREAKER, any model (Add-CB) ..... Add $9.00
- CKT BRKR/SWITCH/PILOT (-CBS) ..... Add $17.00

AT YOUR DEALERS

MasterCard, Visa, American Express
ORDER TOLL FREE 1-800-225-4876
(except AK, HI, PR & Canada)

Electronic Specialists, Inc. 93
171 South Main Street, Natick, Mass. 01760
Technical & Non-800: 1-617-655-1532



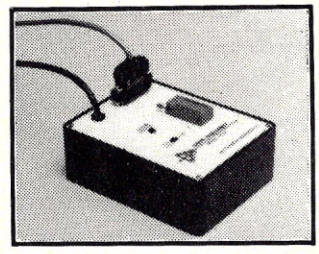
COMPATIBILITY

That's what TNW products are all about. Compatible, quality connections between RS-232 devices and IEEE-488 computers (Commodore PET/CBM, HP-85, Osborne-1 and others). Since 1978, we've manufactured some of the best serial interfaces around. Write or call today for information on TNW's output-only Model 1000, our input/output Model 2000, and our 2-channel TNW-232D. Auto-answer/auto-dial 103 Modem and data communications software for the CBM also available. All units complete with cabinet, documentation and one-year warranty.
Details from George Masters:

TNW CORPORATION ✓ 318

Dept. KM, 3444 Hancock St., San Diego, CA 92110
(714) 296-2115 • TWX 910-335-1194
VISA/MasterCard • Dealer Inquiries Welcome.

Model 953A EPROM PROGRAMMER



- Programs 2508, 2758, 2516, 2716, 2532 and 2732 five volt EPROMS.
- Complete - no personality modules to buy.
- Intelligent - microprocessor based, programs and verifies any or all bytes.
- RS-232 serial interface - use with computer or terminal.
- Verify erasure command - verifies that EPROM is erased.
- Extended diagnostics - error output distinguishes between a bad EPROM and one which needs erasing.
- May be used for extremely reliable data or program storage.
- All power on programming socket under processor control. LED warning light indicates when power is applied.
- Complete with Textool zero insertion force socket.
- High performance/cost ratio.
- Standard DB-25 I/O connector.

PRICE $289

BAY TECHNICAL ASSOCIATES, inc.
HWY. 603, P.O. BOX 387
BAY ST. LOUIS, MISSISSIPPI 39520
(601) 467-8231 ✓ 131

THOUSANDS IN USE DAILY!

This is it . .

ONLY $3.25 EACH
For 5 or more
$4.50 EACH SINGLY
PRICE INCLUDES SHIPPING WITHIN CONT. USA

Can be used with most any adjustable tractor feed printer including **MX80, H14, TI810, etc.**

Made from MYLAR to withstand continuous use

the answer to your problem of how to run single sheets of your letterhead or a snap-a-part form thru a tractor feed printer. . .just insert your form or stationery into the ***PAPER PORTER***™, place in your printer, align the print head and start printing. . . .

PAYMENT MUST ACCOMPANY YOUR ORDER
SEND CHECK, VISA OR MASTER-CARD

SEND $1.00 TO RECEIVE OUR 1982 CATALOG

PAPERWARE™
PROGRAMMING AIDS FOR THE MICRO-COMPUTER
BY **BEELINE SERVICES** ✓ 247
FORMERLY MINIT-MAN PRINTING
211 E. ALLEGAN STREET
OTSEGO, MICH. 49078
(616) 694-6424

FREE!

MICROCOMPUTER IDEA BOOK & CATALOG.

- **One-Stop Shopping.** More than 1000 microcomputer accessories and supplies – from diskettes and line-printer paper to connectors and cables – for Apple, Atari, Northstar, TRS-80s and many others. Loaded with ideas for extra convenience and efficiency.
- **Easy Ordering.** By mail, phone, or TWX. Friendly, helpful, expert assistance.
- **Fast Delivery.** Your order shipped in 24 hours from the Inmac Center nearest you. Overnight emergency shipments also available.
- **Risk-Free Trial.** Try any product for 45 days. If not satisfied, return for full refund.
- **Guaranteed Quality.** Field-tested for precision performance and compatibility. Backed by warranties ranging up to 10 years – and some with Lifetime Guarantees.

Please RUSH my copy of the Microcomputer Idea Book & Catalog.

Name _____ Title _____
Company _____ Phone _____
Address _____
City _____ State _____ Zip _____

SEND TODAY FOR YOUR FREE MICROCOMPUTER IDEA BOOK & CATALOG OR PHONE (408) 727-1970.

inmac
Catalog Dept.,
2465 Augustine Dr.,
Santa Clara,
CA 95051. ✓ 138

✓ See List of Advertisers on page 130

For a minimal investment, you can add audio output to Heath's All-In-One Computer.

The H-89 Sounds Off

By Alan E. Hufnagel

The H-89 computer, like many others, has a beeper which sounds when the bell command (ASCII control-G) is given to the terminal section. An internal speaker gives a short tone when something goes wrong or to wake up sleepy operators. While a single tone is acceptable for these purposes, I found that it somehow lacked that certain creativity that we all like to put in our programs. For about two dollars, and a minimum of work, I changed all that and opened up the world of sound for the H-89.

First, let's look at the hardware provided by Heath. Fig. 1 shows the original beeper circuit. This circuit drives the speaker directly from the output of a TTL gate (U416 on Heath schematics). This gate is pulsed by terminal software to produce a square wave output to the speaker. A diode (D402) prevents reverse current flows from the speaker coil from harming the gate's output.

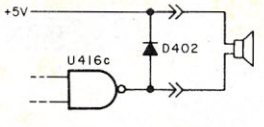


Fig. 1.

Address correspondence to Alan E. Hufnagel, 832 Balfour Road, Montgomery, AL 36117.

Looking on the CPU board, you'll find two unassigned flip-flops (U552), which have their outputs connected to pins 16 and 17 of the expansion connectors (P507, P508, P509). By connecting one of the flip-flops to the speaker and then toggling the output, you'll produce a tone. The faster the flip-flop is toggled, the higher the tone's frequency.

Since I still wanted to be able to sound the original "bell" without any

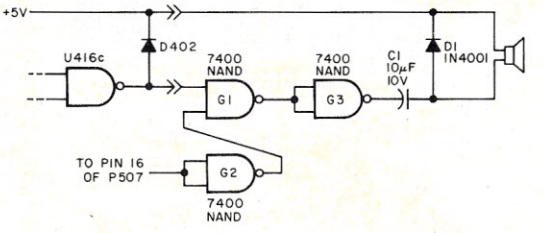


Fig. 2.

```
000   076 020   Start   LD A,020
002   323 362           OUT 362       Turn on Output
004   170               LD A,B        Load delay from B
005   075       Wait1   DEC A         Subtract one
006   000               NOP           Slow
007   000               NOP             It
010   000               NOP               Down
011   040 372           JNZ Wait1     Loop if not done
013   257               XOR A         Make A zero
014   323 362           OUT 362       Turn off Output
016   170               LD A,B        Load delay from B
017   075       Wait2   DEC A         Subtract one
020   000               NOP           Slow
021   000               NOP             It
022   000               NOP               Down
023   040 372           JNZ Wait2     Loop if not done
025   005               DEC B         Change delay time
026   030 350           JMP Start     Do it again.
```

Siren routine.

JPC PRODUCTS CO.

68 XX Products

HIGH PERFORMANCE CASSETTE INTERFACE SYSTEM:

- TC-3 — Cassette Interface Kit $59.95
- CFM/3 — Cassette File Manager Program
  - Manual and Listing ..... (X) $19.95
  - CFM/3 on Cassette ..... (X) $26.95
  - CFM/3 on EPROM ..... (X) $39.95
- BASIC/3 — High Speed Cassette Basic ..... (X) $49.95
- DB/SSB — Disk Backup /Software for SSB-DOS ..... (XX) $19.95
- DB/FLEX — Disk Backup Software for FLEX ..... (XX) $19.95
- TS-11 — Cassette Recorder Motor Control Kit ..... $ 6.95

DATA ACQUISITION AND CONTROL:

- AD-16 — 16 Channel A/D Kit $79.95
- DAC-5 — Dual Channel D/A Kit $79.95
- CK-7 — Real Time Clock Kit $59.95
- PA-15 — Parallel Interface Kit $29.95

PRINTER:

- EPSON MX-80 ..... $WRITE
  - Serial Option $65.00

MISCELLANEOUS:

- MX-6 — SS50 Extender Board $19.95
- BT-9 — SS50 Bus Terminator Kit $14.95
- C10 Data Cassettes
  - Ferric ..... $ 1.39
  - Chrome ..... $ 1.99

- For Assembly and Test on all kits — add $30.00

(X) Specify 6800 or 6809 (XX) 6800 only

Terms: Cash, Master Card or Visa
Shipping & Handling $ 3.50 (US)
$5.50 (Canada) $15.00 (Foreign)

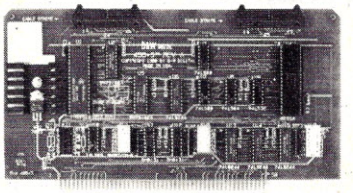
Technical Inquiries: Phone 6:00-7:00 MST

JPC PRODUCTS CO. '92
Phone (505) 294-4623
12021 Paisano Ct.
Albuquerque, N.M. 87112

See List of Advertisers on page 130

THE 488+3 IEEE 488 TO S-100 INTERFACE

IEEE-488



S-100

- Handles all IEEE-488 1975/78 functions
- IEEE 696 (S-100) compatible
- MBASIC subroutines supplied; no BIOS mods required
- 3 parallel ports (8255A-5)
- Industrial quality; burned in and tested
- $375

(Dealer inquiries invited)

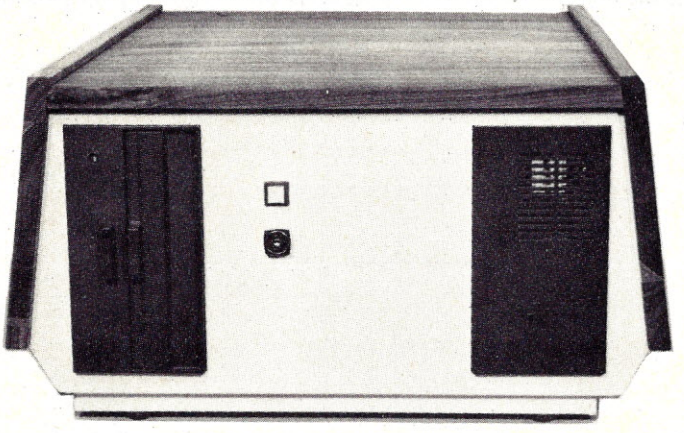
D&W DIGITAL ↙199
1524 REDWOOD DRIVE
LOS ALTOS, CA 94022 (415) 966-1460

DEALERS... SELL MICROCOMPUTING

Selling MICROCOMPUTING, the most complete journal of microcomputing, brings the computer enthusiast through your door. Once he's in your store, you can sell him anything.

For information on selling MICROCOMPUTING, call (603) 924-9471 and speak with Ginnie Boudrieau, our bulk sales manager, or write to her at Microcomputing, 80 Pine Street, Peterborough, NH 03458.

Our dealers are telling us that MICROCOMPUTING is the hottest-selling computer magazine on the newsstand, so call today and join the ranks of dealers who make money with MICROCOMPUTING.



Golden West Computers

Series 999 Fills the Gap in Business Systems

The Golden West Computer Family allows you to plan for the future with your very first system.

The Series 999 system is the state of the art in single user systems, designed for dependable performance. Reliability is built into each system at every stage of assembly.

The Golden West family of small business systems was modularly designed with expansion in mind. Multi-user and/or hard disk, for example, will fit right into your present system. Sudden obsolescence has become obsolete.

CPU
4 MHz Z80A CPU

Disk Storage
Dual 8" floppies—2 megabytes
8" hard disk—10, 20, 30, or 40 megabytes

MEMORY
2K EPROM
200 nsec. RAM
Bank switchable
64K bytes single user
256K bytes multi-user/task

Real-time Clock
Hours, minutes, seconds
Day, month, year
Software settable

I/O
12 bits parrallel I/O
Serial I/O—software selectable
Two RS-232C ports single user
Six RS-232C ports multi-user/task

Operating System—CP/M* or IOS†
Multi-user/task: Multi-OS†
Upward compatible with CP/M*

Language CBasic-2

180 day limited warranty
Dealer Discounts Available

Golden West Computers, Inc. ↙392
60 N. 300 W., Provo, Utah 84601
Telephone (801) 377-2177

*Trademark of Digital Research
†Trademark of Infosoft

software modification, the original connection to U416 had to be preserved. Due to the active output characteristics of TTL, I had to avoid simply connecting the two outputs together. An attempt to simply use capacitors to block the dc paths produced strange results—my system reset each time the bell sounded!

I traced this problem back to the other flip-flops in U552, which control the H-89 system. The capacitors allowed the signal from U416 to get into U552 and changed the state of the other flip-flops. I cured this problem by using the circuit shown in Fig. 2.

In this circuit, gate G1 combines the two signals and eliminates the feedback problem. G2 inverts the flip-flop's signal to maintain proper polarity. G3 buffers the output. Capacitor C1 stops a continuous current from flowing should the output remain in a low state. D1 provides protection as in the original circuit.

Your H-89
need no longer
bow its CRT
to those computers
with fancy music routines.

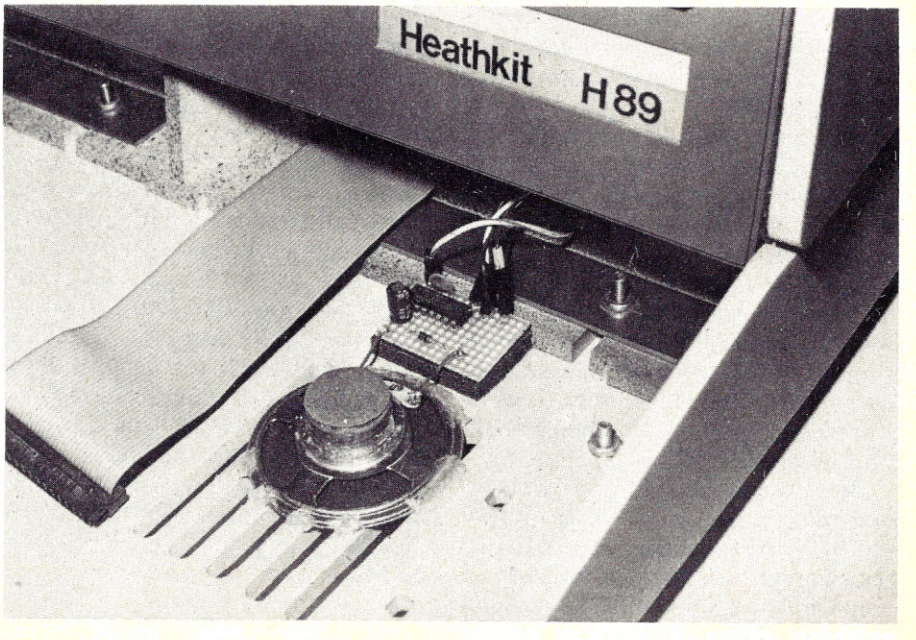
This circuit only uses three parts and may be mounted near the speaker using perfboard. 5 V power for the gates may be obtained using the speaker lead connected to the terminal section's supply. You can ground at any chassis ground point. The Heath construction manual tells the builder to install the speaker under the disk drive, but many H-89 owners have found that the sound of the speaker is better if it's relocated under the keyboard. The photograph of the finished modification shows both the perfboard and speaker in this new location.

I've made two demonstration programs which use the flip-flop toggled by bit 4 of output port 362 (pin 16 of the connectors). The first is a simple routine to create a sawtooth frequency, which will result in a siren-like sound. The second routine scans a data table to obtain duration and frequency information so that any sequence of tones may be played. The location of the data table is identified in the second and third bytes of the program. The table consists of alternating bytes determining the duration and frequency of each tone. If the duration byte is zero for any tone, the program ends. Refinements of these two programs should provide interesting results.

With this modification, your H-89 need no longer bow its CRT to those computers with fancy music routines. The all-in-one computer can now sound off to the world.■

000	041 ppp qqq		LD HL,Table	Load HL with Table Address
003	176	Load	LD A, (HL)	Get Duration
004	247		AND A	(sets Z flag if zero)
005	050 037		JZ End	Stop if zero
007	117		LD C,A	Save Duration
010	043		INC HL	Move table pointer
011	176		LD A, (HL)	Get Frequency
012	127		LD D,A	Save Frequency
013	043		INC HL	Move table pointer
014	076 020	Tone	LD A,020	
016	323 362		OUT 362	Turn on Output
020	102		LD B,D	Load delay from D
021	005	Wait1	DEC B	Subtract one
022	000		NOP	Slow
023	000		NOP	It
024	000		NOP	Down
025	040 372		JNZ Wait1	Loop if not done
027	257		XOR A	Make A zero
030	323 362		OUT 362	Turn off Output
032	102		LD B,D	Load delay from D
033	005	Wait2	DEC B	Subtract one
034	000		NOP	Slow
035	000		NOP	It
036	000		NOP	Down
037	040 372		JNZ Wait2	Loop if not done
041	015		DEC C	Decrement Duration
042	040 350		JNZ Tone	Loop if not done
044	030 335		JMP Load	Get next Tone
046	076 003	End	LD A,003	
050	323 362		OUT 362	Return FF's to normal
052	311		RET	Go back.

Music routine.



H-89 with keyboard assembly removed to show new location of speaker and placement of perfboard.

Here's a chance to pick up some good machine-language programming practices and, at the same time, build an uppercase-lowercase lock routine for your TRS-80 typewriter.

Memory Size—Who Needs It?

By R.S. Lewis

Isn't it a bother to look up memory size every time you want to use an assembly subroutine? If you own a TRS-80 with a disk system, you don't have to do it—you can make your subroutines do it for you.

There's nothing secret about the method. The answer's on page 23 of the TRSDOS version 2.2 fact sheet, though Radio Shack wants to complicate matters by having you make an entry through DEBUG, which is an even worse pain than entering a memory size.

The solution is shown in the assembly listing in Listing 1. The program, incidentally, is an economical way to get your TRS-80 to operate like a typewriter if you've installed a lowercase conversion in it, such as the Pencil conversion, or the one explained in Steven Wexler's article "Lowercase for the TRS-80" on p.132 of the April 1980 *Microcomputing*.

Before I get into what the main program does, however, let's take a look at the housekeeping routine beginning in line 290.

The routine starts by saving the HL registers. That's always a good idea unless you know exactly what DOS or Basic was doing with them just before you took over.

Line 300 loads the address of the keyboard conversion routine GETIT into HL. Line 310 then loads that address into the keyboard device control vector. Once that's done, everything you type on the keyboard will be shunted to GETIT.

Now comes the thing you've been waiting patiently to hear about. GETIT is the working program in this package with the lowest address, so you want to protect GETIT and everything above it with a proper memory size. You do that by decrementing the HL register in line 320 and then loading the address in HL into the memory size block, which is 4049H as advertised by the Radio Shack fact sheet. Now when you go into Basic after calling this program, you'll be able to ignore the memory size question and simply press enter. Memory size will already have been taken care of.

In lines 340 and 350, the program loads the video device control vector with the address of LWRCSE so that everything to be displayed will go to Wexler's routine. Finally, in lines 360 and 370, the housekeeping routine cleans up by recovering HL and jumping back to DOS READY.

There are two more things I ought to point out about the housekeeping routine before I tell you how the program works.

First, notice that the housekeeping routine isn't protected by memory size. It doesn't need to be protected since you'll only run it once and then throw it away. By putting it below the machine-language programs you want to save, you can make this kind of routine any length you want, and make it do any number of one-time tasks you want it to, without cluttering up memory. This is the place, for instance, to put your RS-232 initialization routines instead of inside the protected program as Radio Shack does with the DECWRITER driver listed in their RS-232 manual.

Second, notice that I didn't try to reset the device control vectors or the memory size locations with DEFW instructions. In most programs of this kind lines 300 and 310 would have read:

```
300    ORG    4016H
310    DEFW   GETIT
```

The problem with this approach is that although it works fine with tape, you can't use Tapedisk to save a program that starts at 4016H and ends at FFF9H.

The Program Explained

After these revelations anything I say about the rest of the program would be anticlimactic, but I'll tell you about the program anyway.

First, you need to get it into your editor/assembler and assemble it. Once you have an object tape, go to Tapedisk and read in the tape. File it with the F command as follows: F TYPE/CMD:0 FFA3 FFF9 FFA3. If you're working with 16K, the addresses are 7FA9 7FFF 7FA9. If you have 32K, use BFA9 BFFF BFA9.

If you're wondering why the 48K version stops at FFF9 instead of FFFF, you haven't been reading Radio Shack's newsletters. When you're writing high-memory assembly programs you want to stay out of the last six bytes in the 48K system. Strange things happen up there. Those last six bytes are only good for a four-letter word with two left over anyway.

Now, in DOS-ready mode, type TYPE. The machine-language system will load, and you'll get a DOS READY again. Flip the switch on your lowercase conversion kit and hit the shift-down arrow. Start typing and you'll be typing lowercase letters. The shift works exactly the way it works on a standard typewriter.

R.S. Lewis [20 Grand Ave., Manitou Springs, CO 80829] is president of H.S.D., Inc., a software developer for custom and off-the-shelf applications.

The shift-lock is the shift-down arrow. It's similar to the Electric Pencil's shift, except you don't have that long stretch between the shift and the break key.

If you don't have disk, you can modify the program as follows and make it work: First delete lines 320 and 330. You'll have to set memory size manually. Second, change line 370 to read, JP 1A19H ;RETURN TO BASIC. Third, change line 570 to read, GETIT CALL 03E3H ;SCAN KEYBOARD. Finally, on the bottom line, 1180, add the origin address after END. For 48K, the line would read, END 07FA9H.

Assemble the program and make an object tape. When MEMORY SIZE appears, reserve memory starting one byte above the origin. Go to SYSTEM and load the tape using whatever name you assigned it. When the prompt comes back enter a slash and hit enter. You'll now have your typewriter.

Unfortunately, in this tape version, you don't throw away the housekeeping routine. But you can still do that and save memory by using DEFW statements. To make that change, throw out lines 220, 290 and 360 in addition to 320 and 330. Rewrite lines 300, 310, 340 and 350 as follows:

```
300     ORG     4016H
310     DEFW    GETIT
340     ORG     401EH
350     DEFW    LWRCSE
```

Then add a new ORG line like this:

```
370     ORG     0FFB8H
```

to get the rest of the program into its proper place. Don't use an address after END in this version.

When you get ready to load the result, protect memory starting one byte below 0FFB8H, or whatever origin you used in line 370. Use the break key after loading to get back to Basic. The housekeeping routine will still do its job, but it won't have to reside in memory. If setting memory size annoys you, you'll just have to get that disk.

TYPE/CMD can be just the beginning of a whole system of subroutines. If you're using a serial printer you may want to add a driver along with bells and whistles such as Allan J. Domuret's line-limiting feature ("Uppercase/Lowercase Utility for the TRS-80," March 1980, p.38), or a page-limiting feature. You can add any programs you want below the listing for TYPE/CMD, as long as you make sure you change any device control block vectors that are affected and reset the origin in line 220 so that the program stays within available memory. Provided your add-ons stay below GETIT, you don't have to change the memory size protection entries in lines 300 through 330.

On the other hand, if all you want is standard typewriter capability on your TRS-80, "TYPE/CMD" is a cheap way to get it. The price is only 66 bytes of memory. ■

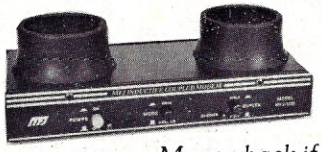
Program listing. Assembly listing of TRS-80 typewriter programs.

```
                00100 ;PROGRAM "TYPE/CMD"  VERSION 1.1
                00110 ;04/24/80
                00120 ;BY R.S. LEWIS
                00130 ;BOX 992
                00140 ;MANITOU SPRINGS, CO 80829
                00150 ;
                00160 ;****** SET THE ORIGIN ******
                00170 ;
                00180 ;16K ORG = 07FA9H
                00190 ;32K ORG = 0BFA9H
                00200 ;48K ORG = 0FFA3H
                00210 ;
FFA3            00220         ORG     0FFA3H
                00230 ;
                00240 ;****** HOUSEKEEPING ROUTINE ******
                00250 ;THIS PART OF THE PROGRAM RE-DIRECTS
                00260 ;DCB'S FOR THE KEYBOARD AND THE SCREEN
                00270 ;DRIVERS AND AUTOMATICALLY SETS MEMORY SIZE
                00280 ;
FFA3 E5         00290         PUSH    HL  ;SAVE IT
FFA4 21B8FF     00300         LD      HL,GETIT  ;PROGRAM ADDRESS
FFA7 221640     00310         LD      (4016H),HL  ;PUT IN KBD DCB
FFAA 2B         00320         DEC     HL  ;PROG LESS 1 BYTE
FFAB 224940     00330         LD      (4049H),HL  ;PUT IN MEM SIZE
FFAE 21E4FF     00340         LD      HL,LWRCSE  ;VID PATCH ADDR
FFB1 221E40     00350         LD      (401EH),HL  ;PUT IN VID DCB
FFB4 E1         00360         POP     HL  ;GET IT BACK
FFB5 C32D40     00370         JP      402DH  ;RETURN TO DOS
                00380 ;
                00390 ;END HOUSEKEEPING ROUTINE.
```

More →

INDUCTIVE COUPLED MODEM

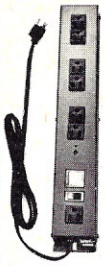
Eliminates noise, vibration problems. Originate/Answer. Bell 103. Cassette port saves data.

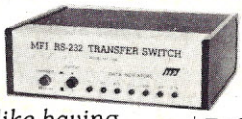


$129.95 *Money back if not delighted*

MFJ-1230 INDUCTIVE COUPLED MODEM eliminates room noise, vibration caused by acoustic coupling. Gives more reliable data transfer. Used like acoustic modem. 0-300 Baud, Bell 103 compatible. Originate/answer. Half/full duplex. RS-232, TTL, CMOS compatible. **Use any computer.** Cassette tape ports save data. 110 VAC or 9 V batteries. Crystal controlled. Carrier detect, power LEDs. 9x1½x4". **MFJ-1231, $39.95.** Optional cable, software for Apple II, II Plus. Plugs into game port. No serial board needed.

$99.95 **MFJ-1108 AC POWER CENTER.** Adds convenience, prevents data loss, head bounce, equipment damage. **Relay** latches power off during power transients. **Multi filters** isolate equipment, eliminate interaction, noise, hash. **Varistors** suppress spikes. 3 isolated, switched socket pairs. One unswitched for clock, etc. Lighted power, reset switch. Pop-out fuse. 3 wire, 6 ft. cord. 15 A/125 V, 1875 watts. Aluminum case. Black. 18x2¾ x2 in. **MFJ-1107, $79.95.** Like 1108 less relay. 8 sockets. 2 unswitched. **Other models available.**





It's like having an extra port $79.95

MFJ-1240 RS-232 TRANSFER SWITCH. Switches computer between 2 peripherals (printer, terminal, modem, etc.). Like having extra port. **Push button switches** 10 lines (pins 2,3,4,5,6,8, 11,15,17,20). Change plug or cable to substitute other lines. Push button reverses transmit-receive lines. LEDs monitor pins 2,3,4,5,6,8,20. PC board eliminates wiring, crosstalk, line interference. 3 RS-232 25 pin connectors. 7x2x6 in.

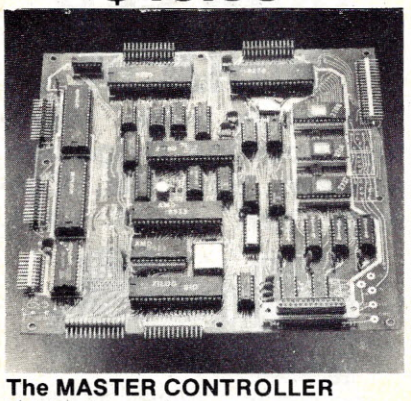
Order from MFJ and try it. If not delighted, return within 30 days for refund (less shipping).
One year unconditional guarantee.
Order yours today. Call toll free 800-647-1800.
Charge VISA, MC. Or mail check, money order. Add $4.00 each for shipping and handling.

CALL TOLL FREE ... 800-647-1800

Call 601-323-5869 for technical information, order/repair status. Also call 601-323-5869 outside continental USA and in Mississippi. 316

MFJ ENTERPRISES, INCORPORATED
921 Louisville Road, Starkville, MS 39759

SINGLE BOARD COMPUTER
$49.95



The MASTER CONTROLLER BOARD contains:

Z-80 Microprocessor: will run 8080/8085 and Z-80 programs.

72 - Parallel I/O lines; three 8255s Keyboard controller: 8279 (also can control a 16 digit seven segment display)

12K - EPROM: three sockets for 2708, 2716, 2732,

2K - RAM: 2114s

8 - Sixteen bit counter timer channels: one 8253 and one AMD 9513

2 - Serial I/O ports; one Z-80 SIO chip. One port has an RS-232 interface and connector.

1 - High speed arithmetic processor: AMD 9511 or AMD 9512

All the I/O chips are memory mapped AND I/O mapped. A bus expansion connector is provided. Can be operated on 5 volts only.

All this on one board less than nine inches on a side

Only three LSI chips (Z-80, 8255, and EPROM) plus support gates and buffers are required for a working controller.

BARE BOARD $49.95
With documentation.

MINIMUM KIT $99.95 Includes bare board with documentation, one each Z-80, 8255, 2708, two 2114s, and support gates and buffers, all socketed.

MONITOR $39.95 This program allows a TTY or CRT to control the MASTER CONTROLLER. This program requires the minimum kit and monitor parts kit. A programmed 2708 is supplied with the MONITOR.

MONITOR PARTS $54.95
Includes 8253, Z-80 SIO, 1488, 1489, and connector.

POWER SUPPLY $39.95 +5V 1A, -5V ¼A, +12V ¼A, -12V ¼A

POWER SUPPLY $44.95 +5V 2A, otherwise same as above.

Please include $2 postage and handling.

OEM and dealer inquiries invited.
VISA and MASTER CARD accepted.

R.W. ELECTRONICS ↩390
3165 North Clybourn
Chicago, IL 60618
(312) 248-2480

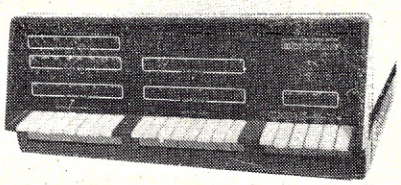
Listing continued.

```
                00400 ;ONCE USED, EVERYTHING ABOVE THIS IS
                00410 ;THROWN AWAY.
                00420 ;
                00430 ;****** UPPER/LOWER SHIFT ROUTINE ******
                00440 ;THIS PROGRAM LOOKS AT AN INCOMING BYTE
                00450 ;FROM THE KEYBOARD.  IF IT IS A SHIFT-
                00460 ;SIGNAL, THE PROGRAM REVERSES THE SHIFT-
                00470 ;LOCK SWITCH.  IF THE BYTE IS ANYTHING
                00480 ;ELSE, THE PROGRAM CHECKS TO SEE IF IT IS
                00490 ;A LETTER.  IF IT IS, THE PROGRAM CHECKS
                00500 ;THE SHIFT-LOCK SWITCH.  IF IT IS ON, THE
                00510 ;PROGRAM INVERTS THE LETTER AND THEN
                00520 ;RETURNS TO THE REST OF THE DOS KEYBOARD
                00530 ;ROUTINE.
                00540 ;
                00550 ;---LOOK FOR AN INPUT---
                00560 ;
FFB8 CDD843     00570 GETIT   CALL    43D8H  ;SCAN KEYBOARD
                00580 ;
                00590 ;---IF IT'S A SHIFT SIGNAL,
                00600 ;---SEND TO SHIFT LOCK FLIP---
                00610 ;
FFBB FE1A       00620         CP      1AH  ;SHIFT SIGNAL?
FFBD 281A       00630         JR      Z,FLIP  ;IF SO
                00640 ;
                00650 ;---WHAT IS IT?---
                00660 ;
FFBF FE41       00670         CP      65  ;TOO LOW FOR LTR?
FFC1 F8         00680         RET     M  ;EXIT IF SO
FFC2 FE5B       00690         CP      91  ;UPPERCASE LTR?
FFC4 3806       00700         JR      C,FLOP  ;IF SO
FFC6 FE61       00710         CP      97  ;ARROWS ETC?
FFC8 F8         00720         RET     M  ;EXIT IF SO
FFC9 FE7B       00730         CP      123  ;GRAPHICS?
FFCB D0         00740         RET     NC  ;EXIT IF SO
                00750 ;
                00760 ;---IT'S A LETTER---
                00770 ;
FFCC F5         00780 FLOP    PUSH    AF  ;SAVE IT
FFCD 3AE3FF     00790         LD      A,(SWITCH)  ;GET SWITCH
FFD0 B7         00800         OR      A  ;IS IT ON?
FFD1 2002       00810         JR      NZ,INVERT  ;YEP
FFD3 F1         00820         POP     AF  ;NOPE
FFD4 C9         00830         RET         ;EXIT
FFD5 F1         00840 INVERT  POP     AF  ;GET IT BACK
FFD6 EE20       00850         XOR     20H  ;FLOP IT
FFD8 C9         00860         RET         ;EXIT
                00870 ;
                00880 ;---FLIP THE SWITCH---
                00890 ;
FFD9 3AE3FF     00900 FLIP    LD      A,(SWITCH) ;GET IT
FFDC EE01       00910         XOR     1H  ;FLIP IT
FFDE 32E3FF     00920         LD      (SWITCH),A  ;PUT IT BACK
FFE1 AF         00930         XOR     A  ;CLEAR A
FFE2 C9         00940         RET       ;EXIT
                00950 ;
                00960 ;---THIS IS THE SWITCH---
                00970 ;
FFE3 00         00980 SWITCH  DEFB    0 ;IT'S OFF TO START
                00990 ;
                01000 ;END UPPERCASE/LOWERCASE SHIFT ROUTINE
                01010 ;
                01020 ;****** LOWERCASE PATCH ******
                01030 ;ROUTINE PUBLISHED IN MR. WEXLER'S
                01040 ;ARTICLE IN THE 4/80 KILOBAUD.
                01050 ;
FFE4 DD6E03     01060 LWRCSE  LD      L,(IX+3)
FFE7 DD6604     01070         LD      H,(IX+4)
FFEA DA9A04     01080         JP      C,49AH
FFED AF         01090         XOR     A
FFEE B1         01100         OR      C
FFEF FAA604     01110         JP      M,4A6H
FFF2 FE20       01120         CP      20H
FFF4 D27D04     01130         JP      NC,47DH
FFF7 C36004     01140         JP      460H
                01150 ;
                01160 ; END LOWERCASE DISPLAY PATCH
                01170 ;
0000            01180         END
00000 TOTAL ERRORS

INVERT  FFD5
SWITCH  FFE3
FLOP    FFCC
FLIP    FFD9
LWRCSE  FFE4
GETIT   FFB8
```

Best prices anywhere. We beat 'em all!

COMPUTERS

INTERSYSTEMS



DPS1 DPS1A DPS2A ... CALL FOR PRICES

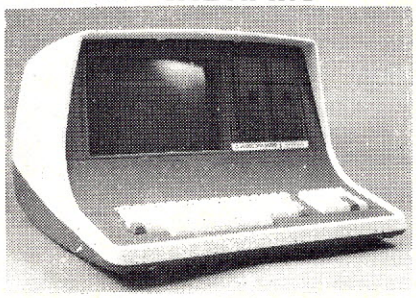
DYNABYTE List ..... Less 30%

ALTOS List ..... Less 20%

NORTHSTAR
Horizons & Advantages ..... CALL

TELEVIDEO COMPUTER SYSTEMS ..... CALL

SUPERBRAIN



64K DD **$2639**
64K QD **$2949**
DSS-10MEG Hard Disk **$3195**

CROMEMCO

CS-1 List, $3995 ..... OUR PRICE **$3195**
CS-2 List, $4695 ..... OUR PRICE **$3549**
CS-3 List, $7995 ..... OUR PRICE **$6349**
Z2H List, $9995 ..... OUR PRICE **$7995**

ZENITH | **data systems**

Z-89 List $2895
OUR PRICE
$2099

TERMINALS

TeleVideo

Televideo 910C ..... CALL
912C ..... CALL
920C ..... CALL
925C ..... CALL
950C ..... CALL

INTERTUBE **$725**
Emulator **$725**

OKIDATA

Microline 80 ..... $359
Microline 82A $469
Microline 83A $749

C.ITOH ..... CALL FOR PRICES

SOROC

Soroc IQ120 ..... **$679**
IQ130 ..... **$585**
IQ135 ..... **$719**
IQ135 w/ graphics $789
IQ140 ..... **$995**

HAZELTINE

1420 ..... CALL
1500 ..... SAVE
1510 ..... CALL

ZENITH Z19 ..... **$639**

Prices are for **pre-paid orders only**, and reflect a cash discount. C.O.D.'s and charge cards slightly higher.

Most items in stock for immediate delivery. factory sealed cartons w full factory warranty. NYS residents add appropriate sales tax. Prices do not include shipping. C.O.D. orders require 25% deposit. Prices subject to change without notice.

PRINTERS

CENTRONICS

749-1 PAR **$699**
739-3 SER **$619**
704-11 parallel **$1569**
704-9 (RS232) **$1519**

TI 810

810 Basic **$1289**
810 Full Option **$1599**
820 RO Basic **$1545**
820 KSR Basic **$1739**

NEC 7710 (RS232) SERIAL **$2395**
7730 PARALLEL **$2395**

Qume ..... CALL FOR PRICE

Diablo 630 RO **$2049**
1640 KSR **$3495**
1640 RO **$3095**

Paper Tiger 445G **$739**
460 ..... **$799**
460G **$839**
560G **$1099**

Prism 80 ..... **$895**
132 w/color **$1495**

Epson
MX 80 ..... $465
MX 80FT $548
MX 100 ..... $745

DISK SYSTEMS

MORROW

Discus 2D **$835**
Dual Discuss 2D **$1385**
Discuss 2 + 2 ..... **$1199**
M 5 5meg Hard Disk **$1995**
M 10 10 meg Hard Disk **$2995**
M26 26 meg Hard Disk **$3349**

CORVUS 5 meg Hard Disk **$2999**
CORVUS 10 meg Hard Disk **$4279**
CORVUS 20 meg Hard Disk **$5159**

COMPUTERS WHOLESALE

P.O. Box 144 Camillus, N.Y. 13031 ⌐227

315·472-2582

Prices subject to change without notice

An application of artificial intelligence research that puts valuable information at your fingertips.

Information Retrieval—Quick and Dirty

By Murray L. Lesser

Would you like to break the magazine packrat habit? Are back issues filling every available corner of your house and office? Does it bother you when you can't find that article you dimly remember having seen in one of your magazines—only three years ago? What you need is an information retrieval system, one that will find the article you are looking for and let you ignore the rest.

QADIRS is a "programless" information retrieval system. Instead of requiring a special database manager, it uses any line editor that has the *global find* function. While you could use Digital Research's ED (the one bundled in with your CP/M system at no extra cost), I find the features of Microsoft's Edit-80 more convenient. However, if you don't own a suitable line editor, you can use your Basic interpreter in command mode to build the file and a simple Basic program for retrieval.

If you are too insecure to kick packratting cold turkey, you can "index" every article in every magazine, secure in the knowledge that you can always find what you are looking for later—if it exists.

The lineal ancestor of QADIRS is KWIC—Key Word In Context. KWIC was devised in 1959 by the late Hans Peter Luhn, then working for IBM. It was a rather clumsy batch procedure—certainly not necessary for an interactive system such as yours—and is no longer favored in information-retrieval circles. But KWIC was widely used in its day, in spite of its drawbacks. So let us review what it was, how it worked, and how we can eliminate some of its shortcomings in adapting it for use with a modern microcomputer system.

KWIC

Luhn was one of the pioneers in mechanized information retrieval. His major interest was in automatic abstracting. He wanted to program a computer to abstract the key information from articles in professional journals and provide only those abstracts to busy scientists and engineers. As with many of the results of artificial intelligence research, it turned out there was no use for his procedure. In those days, the entire article had to be keypunched (into cards!) from the printed text to get it into the computer to be abstracted, which made the cost prohibitive. Besides, the editors of professional journals were, and still are, insistent that the author provide a human-generated abstract to be printed near the beginning of each article published.

Along the way, Luhn noticed that most titles of technical articles contained many of the key words he was picking up in his automatic abstracts. The title itself tended to be an abbreviated abstract of the paper. This led him to KWIC, first reported in an internal IBM report in August 1959.

Somehow, a review of that report reached the Association for Computing Machinery's (ACM) *Computer Reviews* early in 1960. The reviewer didn't think much of the idea; he claimed to have conducted an "experiment similar in philosophy" in 1952, with dismal results. This didn't stop *Computer Reviews*. It began publishing an annual KWIC index to all the papers that had been reviewed. Those annual volumes are still the best bibliographic source of information on the computer literature published prior to and during the 1960s. For example, the KWIC index entry for Luhn's paper has *Computer Reviews* index number 6013 0094, which keys it to the original review in the journal.

A KWIC index was derived as follows: Each article to be indexed was given an accession number—a serial number that would identify that article to the system forevermore. The only information to be keypunched was the accession number, author's name, title and source. The title portion of the record was manipulated by the KWIC program, which produced a new record for each keyword in the title. All words in the title (except for a few common "stop" words such as "a," "and," "the" and "but") were treated as keywords.

Each new record would contain only the accession number and the rotated title. In the title field, the keyword would come first, followed by the rest of the title, followed by an end mark (perhaps ". . ."), followed by the portion of the title that preceded the keyword.

These index records were then sorted by the title field, and were printed in the KWIC index book in keyword sequence. The complete reference records as originally punched were printed in the back of the book in accession number order, along with an author index keyed to the same numbers.

Address correspondence to Murray L. Lesser, c/o Microcomputing.

```
00068   CP/M ... A Print Utility for
00037   CP/M ... Hardcopy Device Driver Programs for
00039   CP/M ... Start/Exit Routine for
00014   CP/M Compatible Software ... An Overview of
00043   CP/M Encryption Prescription ...
00005   CP/M Primer ...
00066   CP/M Systems ... "Turn-Key"
00047   CP/M Users ... The Master Catalog System for
00025   CP/M Version 2.0, An 8080/Z80 Operating System ...
00101   CP/M and Microsoft BASIC ... Optional Printing with
00064   CP/M: Automatic Program Execution on Start-up ... For
```

Fig. 1. Portion of a simulated KWIC index.

KWIC indexes were very easy to use. You looked at the section containing the word you were interested in and read through the associated list of titles. If you found a title that looked useful, the accession number would lead you to the complete bibliographic information.

Just to give you a feel of how it worked, I have simulated a piece of a KWIC index in Fig. 1. The strange alphabetizing is the consequence of the strange collating sequence invented by the perpetrators of the American Standard Code for Information Interchange (ASCII).

KWIC suffered from two drawbacks, one intellectual and one practical. The intellectual drawback occurred when the author decided on a cute title that didn't contain sufficient keywords to provide an abbreviated abstract. The solution was to add a little human reviewing—the reviewer would add a few keywords to the record. The result was sometimes referred to as a KWOC (Key Word Out of Context) index. In a KWOC index, the accession number would be followed by the keyword, which was then followed by the nonrotated title.

QADIRS

QADIRS makes use of this added information. For each indexed article with an inadequate title, the user must append the important keywords that might be needed for later retrieval. With a little practice, it is surprisingly easy to do this. You don't even need to read the article in detail; merely skim through it for general content. I have used my QADIRS file to find valuable information in articles I merely glanced through when the magazine arrived.

The practical drawback to KWIC, and its variants, was the necessity of all that rotating and sorting to produce the book, as well as the shelf space necessary to store the multiple volumes. This is now completely unnecessary. With an interactive system on your microcomputer, only one record per entry is produced and the entire file can be kept on a disk. The search for all records containing the keyword or author desired is done on demand, at the time of inquiry.

An excerpt from my QADIRS file, complete with added keywords, is shown in Fig. 2. The format is completely arbitrary; you don't have to use mine if you don't like it. Actually, the hardest part of setting up such a file is choosing a format that will please you.

Each entry in the file is a logical "line" as produced by Microsoft's Edit-80. The separate physical lines within the record are produced by keying LF TAB TAB for each line break. (Use control-J for LF and control-I for TAB if your keyboard does not have these keys.) The sequence numbers are generated automatically by the editor's line-number assignment capability.

To use QADIRS in a CP/M system, merely key in "EDIT80 QADIRS.". The period is part of the call, to prevent Edit-80 from adding the filetype .MAC. This sets up the file for a new entry or retrieval. To add a new item

```
00038   Lesser, Murray L.: "Binary Cents and the Smart Checkbook"
            INTERFACE AGE Oct 1980 p70 (BASIC)
00039   Barbier, Ken: "Start/Exit Routine for CP/M"
            MICROCOMPUTING Oct 1980 p82 (8080 Assembly Monitor Jump)
00040   Hudson, Larry "A Cross Reference Program for Northstar BASIC"
            DR. DOBB'S Oct 1980 p32 (8080 Assembly)
00041   McCahan, Walter K.: "Software Security"
            MICROCOMPUTING Nov 1980 p24 (BASIC Password)
00042   Monagan, James: "Efficient Data Storage for Microsoft BASIC"
            MICROCOMPUTING Nov 1980 p68 (Packing)
00043   Sclawy, Alan: "CP/M Encryption Prescription"
            MICROCOMPUTING Nov 1980 p42 (Crypto BASIC)
00044   Parsons, Thomas W.: "All about ASCII"  MICROCOMPUTING Nov 1980 p129
00045   Barbier, Ken: "Relocating the Dynamic Debugging Tool"
            MICROCOMPUTING Nov 1980 p181 (CP/M DDT 8080 Assembly)
00046   Pournelle, Jerry: "BASIC, Computer Languages, and Computer Adventures"
            BYTE Dec 1980 p222 (C-Language Pascal BASCOM)
00047   Hallen, Rod: "The Master Catalog System for CP/M Users"
            MICROCOMPUTING Dec 1980 p188
00048   Walker, Bill: "Sorting with Binary Trees"  BYTE Oct 1980 p96
00049   Dea, Robert. W.: "An 8080 to Z80 Translator System"
            DR. DOBB'S May 1980 p47 (BASIC)
00050   Hughes, Lawrence E.: "MFT: A Multiple File Transfer Utility"
            DR DOBB'S Oct 1980 p24 (Assembly 8080 CP/M)
00051   Whaland, Norman: "Interpretive Programming"
            CREATIVE COMPUTING Apr 1979 p124 (Assembly)
```

Fig. 2. Excerpt from a QADIRS file.

COMPUTER CASSETTES
100% ERROR-FREE

LENGTH	12 PACK	24 PACK
C-05	69¢	59¢
C-10	79¢	69¢
C-20	99¢	89¢

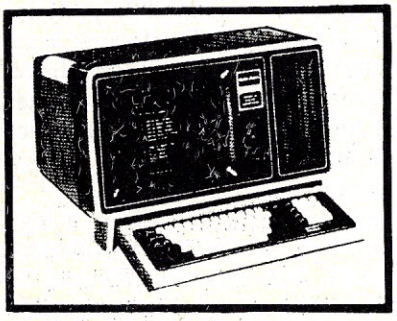
- Fully Guaranteed!
- World's Finest Media
- Custom Storage Case, Add 20¢ Each
- UPS Shipping Add $3.00 Per Pack

FOR ORDERS ONLY
1-800-426-4747
Extension 480

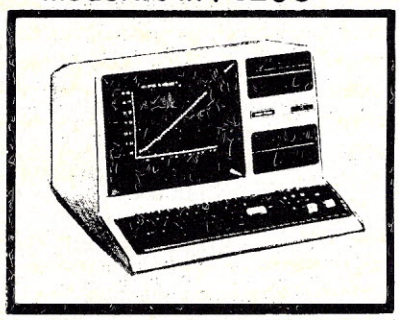
MICRO-80™ INC. 308
K-2665 NO. BUSBY ROAD
OAK HARBOR, WA 98277

See List of Advertisers on page 130

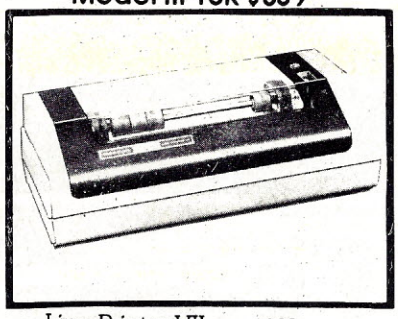
We have THE
LOWEST PRICES
ON TRS-80™



Model II 64K $ 3298



Model III 16K $839



Line Printer VII. $329

OKIDATA	Microline 80	$394
	Microline 82	$499
EPSON MX-70		$389
EPSON MX-80		$479

$ SAVE

MOST ORDERS SHIPPED WITHIN ONE BUSINESS DAY $

VERBATIM DATALIFE™ DISKETTES

5¼-inch (box of 10)	$25.95
8-inch Double-Density,	$43.95

* Payment: Money Order, Cashier's Check, Certified Check. Personal Checks require 3 weeks to clear. VISA, MASTERCHARGE — Add 3%

WRITE OR CALL FOR OUR COMPLETE PRICE LIST.

CALL (602) 458-2477

All prices are mail order only

RAND'S ✓102

2185 E. FRY BLVD.

SIERRA VISTA, AZ 85635

® TRS-80 is a trademark of Tandy Corporation.

to the list, use the command "I*,1"—this will automatically assign the next accession number. After you've made the entry, you must write the accession number on the article indexed and file it by number so that you can find it later.

When you wish to interrogate the file, you ask to see all records containing a specific keyword by using Edit-80's global find command. This is sufficient as long as you only wish to see the results displayed on your console output. If you want printed output, a little more is required. Edit-80 does not use CP/M's normal BDOS call for output, so the CP/M control-P toggle will not echo this console output to the printer. The Basic program Search, given in Listing 1, will provide printed output.

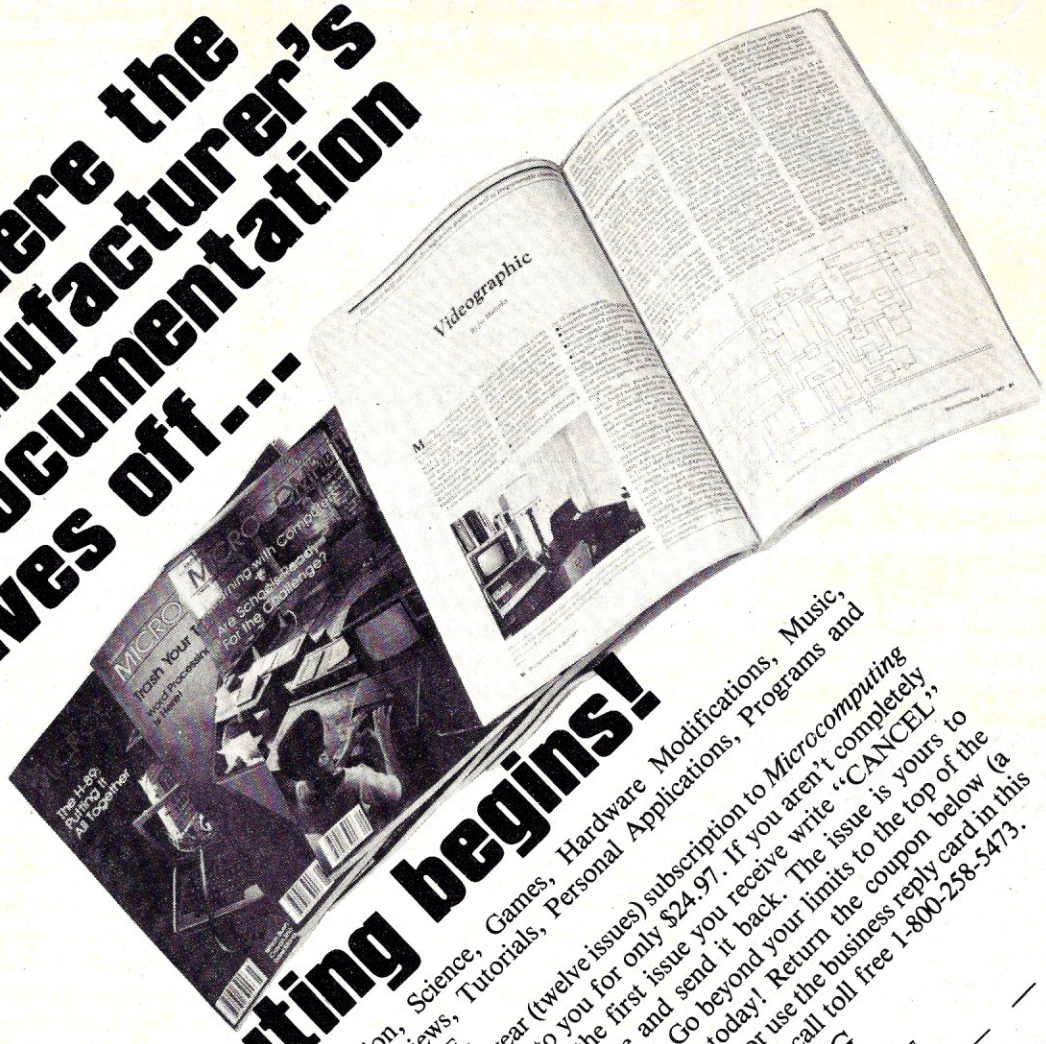
The result of a search of my QADIRS file for entries containing the keyword CP/M is shown in Fig. 3. If you compare this with the simulated KWIC index given in Fig. 1, you'll note that several entries were found only because I added the keyword not in the title.

If you don't own a suitable line editor, you can use your Basic interpreter in command mode to make entries—providing you can file programs in ASCII format. Just remember to make every line a REM statement. You will have to be careful not to duplicate accession numbers, because Basic interpreters in command mode won't remind you that you are reusing an existing line number. Since most Basic interpreters do not have a global find facility as a portion of their edit function, you will have to do all retrieval by using Search. You

```
00100  '                        ******************
00200  '                        ***    SEARCH    ***
00300  '                        ******************
00400  '
00500  '       Written by M. L. Lesser, 5/19/81
00550  '       Modified 8/9/81 to add abort (line 3700)
00600  '       Written in Microsoft BASIC-80, release 5.2
00700  '       Compiled with BASCOM 5.2, switch/Z
00800  '
00900  '       This program searches a sequential file, <dev,filename>,
01000  '       and lists all records having the imbedded string
01100  '       specified by ARGUMENT.  Any word, or adjacent words,
01200  '       that do not include a <Control-C> may be used as
01300  '       the search argument.
01400  '
01500  '       Call with SEARCH <dev:filename>.  If no <dev:filename>
01600  '       is specified on the command line, the program will ask for
01700  '       input of the <dev:filename> to be searched.
01800  '
01900  '       After a search is completed, the program asks for another
02000  '       search argument.  To leave the program, reply to the
02100  '       input request with a <Control-C>.
02200  '
02300  DEFSTR A,F,T
02400  DEFINT J
02500  LPRINT CHR$(27) "C10" CHR$(27) "9"                'Left margin at 10
02600  CALL PICKUP(FILENAME)                             'Get <filename>
02700  IF LEN(FILENAME) <> 0 THEN PRINT "Searching " FILENAME
           ELSE LINE INPUT "ENTER <dev:filename>: "; FILENAME
02800  LINE INPUT "Enter Search Argument (Control-C to quit): "; ARGUMENT
02900  OPEN "I", #1, FILENAME
03000  LPRINT "Searching " FILENAME
03100  LPRINT "Search argument is " CHR$(34) ARGUMENT CHR$(34)
03200  LPRINT
03300  WHILE NOT EOF(1)                                  'Read the file
03400          LINE INPUT #1, TEXTLINE                   'Read a line
03500          IF LEN(TEXTLINE) >= 6 THEN GOSUB 5000     'Remove high-order bits
03600          IF INSTR(TEXTLINE,ARGUMENT) <> 0
                   THEN LPRINT TEXTLINE                 'Print if selected
03700          IF INKEY$ = CHR$(3) THEN END              'Abort on Ctrl-C
03800  WEND
03900  LPRINT:LPRINT:LPRINT
04000  CLOSE
04100  PRINT
04200  GOTO 2800
04300  '
05000  'Subroutine:  Remove any high-order bits from first six bytes
05100  '
05200  FOR J = 1 TO 6
05300          IF ASC(MID$(TEXTLINE,J,1)) > 127 THEN LET
                  MID$(TEXTLINE,J,1) = CHR$(ASC(MID$(TEXTLINE,J,1)) - 128)
05400  NEXT J
05500  RETURN
05600  '
```

Listing 1. The Search program

Where the manufacturer's documentation leaves off...



Microcomputing begins!

Subscribe to *Microcomputing* and go that extra step beyond the directions that came with your computer. Find out what's changing in microcomputing and how it affects you. Get more articles, information and usable programs than any other comparable magazine (we feature 2½ times more quality articles than any of our leading competitors). Make your system more valuable with *Microcomputing*—the journal designed especially to expand and explore the limits of this new and incredible field. *Microcomputing*'s articles are written by experts to teach the newcomer the basics and expand the skills of the experienced. You, your family, friends and associates will all benefit from the comprehensive information that *Microcomputing* features on the following subjects: Business, Data Communications, Education, Science, Games, Hardware Modifications, Music, Reviews, Tutorials, Personal Applications, Programs and MORE.

A full year (twelve issues) subscription to *Microcomputing* is available to you for only $24.97. If you aren't completely satisfied with the first issue you receive write "CANCEL" across the invoice and send it back. The issue is yours to keep, no obligation. Go beyond your limits to the top of the microcomputing field today! Return the coupon below (a photocopy is acceptable) or use the business reply card in this issue. For extra fast service call toll free 1-800-258-5473.

MICROCOMPUTING
A Wayne Green Publication
Subscription Dept., P.O. Box 997, Farmingdale NY 11737

Take me beyond the limits of my system.

☐ 1 yr., USA $24.97 ☐ 1 yr., CANADA $27.97 ☐ 1 yr., FOREIGN SURFACE $44.97
☐ MC ☐ VISA ☐ AE ☐ Check/Money Order Foreign air mail, please inquire.

Mail this coupon to: MICROCOMPUTING, Subscription Department, P.O. Box 997, Farmingdale, NY 11737

Name_____
Address_____
City_____ State_____ Zip_____
Card #_____ Exp. Date_____
Interbank #_____
Signature_____

MICROCOMPUTING
A Wayne Green Publication
Subscription Department
P.O. Box 997
Farmingdale, NY 11737

325B7

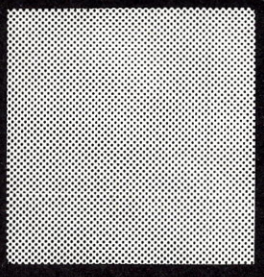
LET'S TALK EPROM PROGRAMMING AND THE S-100 BUS!

You say your eprom programming needs are varied, but your engineering budget doesn't permit the purchase of that $5,000-$7,000 stand-alone programmer?

a.d.s. has the solution!

Hardware

The ads Prom Blaster eprom programming card sits on the I.E.E.E. 696/S-100 bus as an I/O device.



Does not require memory locations!

Handles the following devices: 2708's thru 2764's, single and three supply parts, and the Hitachi 48016 eeprom! Device plugs into on-board LIF socket.

Software

Runs under CP/m* or adsmon MC6809 monitor. Price: $299.00 A & T + shipping. Includes board & software.

For complete details contact:

ackerman ↙311
digital systems, inc.
110 n. york rd.
elmhurst, il. 60126
(312) 530-8992

*CP/m trademark Digital Research, Inc.

ads

may wish to have two versions, one to produce output to the console.

The Search Program

A few words about the Search program: As shown, it was written to be compiled with BASCOM (the compiler version of Microsoft's Basic-80) for use with files written with Microsoft's Edit-80 line editor, the results to be printed on a Qume printer. If your system differs, you'll need to make some changes.

Line 2500 sets the left margin of the Qume to column 10. Change or delete it to meet your requirements.

The assembly-language subroutine Pickup, called in line 2600, picks up the name of the file to be searched from the remainder of the CP/M command line. It was given in my article "Compiled vs Interpreted Basic" (*Microcomputing*, Nov. 1981, p. 180). Pickup can be used only with compiled programs, as explained in that article. If you are using an interpreted version of Basic, delete line 2600, and all of line 2700 up to and including ELSE.

Edit-80 turns on the high-order bits in the line number and the following tab. If you are using an interpreted Basic to make your original entries, or some other line editor with different idiosyncracies, omit line 3500 and the subroutine beginning at line 5000.

Compiled Basic ignores messages from the keyboard except when an input is programmed explicitly. Line 3700 is supplied to allow an abort instead of feeding reams of paper in case of error. It can be omitted if you are running Search under an interpreter.

Several other format-free file maintenance applications can be done in the same "programless" manner as QADIRS. For example, I keep a WORK.LST of things to make, fix or buy for the house and boat. Here, the keywords are TODO and WANT. When the task is eventually finished, I use the intra-line editing capability of the editor to change the operative keyword to DONE.

Other applications of the technique are: packing lists for things to be loaded into the car before heading on a trip, shopping lists, lists of important numbers (Social Security, bank account, credit card, etc.) and the like. In these applications, entries are made to the file whenever they are thought of. The entire file can be printed, using Search, by answering the request-for-search argument with a carriage return.

There are many other uses for the technique, limited only by your ingenuity. Why wait to put those useful database applications on your system until you get around to writing, or buying, a suitable file maintenance program? Use your line editor, instead.■

```
Searching QADIRS
Search argument is "CP/M"

00005   Stewart, John F.: "CP/M Primer" MICROCOMPUTING April 1978 p30
00014   Newberry, Steve: "An Overview of CP/M Compatible Software"
            DR. DOBB'S Jan 1980 p8
00025   Miller, A.R.: "CP/M Version 2.0, An 8080/Z80 Operating System"
            INTERFACE AGE May 1980 p134
00037   Willoughby, Steve: "Hardcopy Device Driver Programs for CP/M"
            DR. DOBB'S Sep 1980 p34 (8080 Assembly Print)
00039   Barbier, Ken: "Start/Exit Routine for CP/M"
            MICROCOMPUTING Oct 1980 p82 (8080 Assembly Monitor Jump)
00043   Sclawy, Alan: "CP/M Encryption Prescription"
            MICROCOMPUTING Nov 1980 p42 (Crypto BASIC)
00045   Barbier, Ken: "Relocating the Dynamic Debugging Tool"
            MICROCOMPUTING Nov 1980 p181 (CP/M DDT 8080 Assembly)
00047   Hallen, Rod: "The Master Catalog System for CP/M Users"
            MICROCOMPUTING Dec 1980 p188
00050   Hughes, Lawrence E.: "MFT: A Multiple File Transfer Utility"
            DR DOBB'S Oct 1980 p24 (Assembly 8080 CP/M)
00063   Fritzson, Richard:  "Data on Disk:  Implementing File Systems"
            MICROCOMPUTING Jan 1981 p111 (CP/M Index Block)
00064   Lindsay, Jon: "For CP/M: Automatic Program Execution on Start-up"
            MICROCOMPUTING Jan 1981 p184 (Auto-Load)
00066   Frantz, James J.: "'Turn-Key' CP/M Systems"
            CREATIVE COMPUTING Dec 1979 p104 (Auto-Load BASIC)
00068   Barbier, Ken: "A Print Utility for CP/M"
            MICROCOMPUTING Feb 1981 p150 (Assembly 8080)
00100   Cotton, Gene: "How to Solve Your Damaged Disk Dilemma"
            INTERFACE AGE Sep 1980 p80 (CP/M File Block 8080 Assembly)
00101   Haanstra, Bruce: "Optional Printing with CP/M and Microsoft BASIC"
            INTERFACE AGE Nov 1980 p84 (IOBYTE)
```

Fig. 3. Output of the Search program in Listing 1.

A feast of computing ideas.

You'll love every byte.

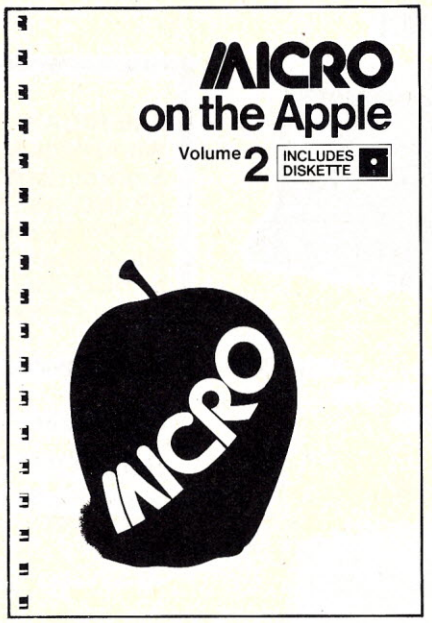
If you work with a 6502 or 6809 based system, you're probably hungry for the facts and ideas that will help you understand the inner workings of your computer. You want to go beyond canned software–use your computer for more than games–learn the advanced programming techniques that enable you to get the most out of your 6502/6809 system.

MICRO, The 6502/6809 Journal, gives you page after page, month after month, of solid information to sink your teeth into. **MICRO** is the premier how-to magazine for serious users of the Apple, PET/CBM, OSI, Atari, AIM, SYM, KIM, and all 6809 based systems including the TRS-80 Color Computer. It's a resource journal internationally respected by professionals in business, industry, and education.

SUBSCRIPTION RATES (U.S. dollars)
Yearly subscription (ISSN 027-9002) saves 20% off the single-issue price.
U.S., $24 (SPECIAL OFFER: Save 30% off single-issue price: 2 years, $42)
Other countries, $27 (via surface mail. Foreign air rates available on request.)

Get more out of your Apple . . .

with the MICRO ON THE APPLE series



VOLUME 2 just released!

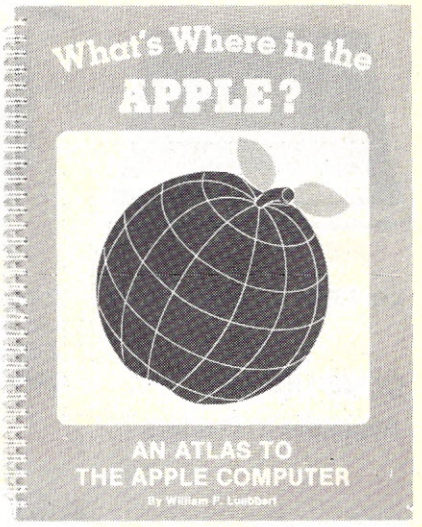
More than 40 new programs on diskette to help you get more from your Apple:

- Machine Language Aids
- I/O Enhancements
- Runtime Utilities
- Graphics and Games
- Hardware and Reference Information

31 choice articles
46 tested programs on diskette (13 sector DOS 3.2 format)

Volume 1 also available at $24.95. Together **MICRO on the Apple 1 & 2** provide more than 70 programs on diskette for less than $1.00 each. No need to type in hundreds of lines of code.

with the most important book ever published for the Apple



The most comprehensive description of Apple II firmware and hardware ever published—all in one place.

What's Where in the Apple?

- Guides you—with a numerical Atlas and an alphabetical Gazetteer—to over **2,000** memory locations of **PEEKs, POKEs** and **CALLs.**
- Gives names and locations of various **Monitor, DOS, Integer BASIC,** and **Applesoft** routines—and tells you what they're used for.
- Helps BASIC users to speed up their programs.
- Enables assembly language programmers to simplify coding and interfacing.

All Apple users will find this book helpful in understanding their machine, and essential for mastering it!

★ Look for all these **MICRO INK** publications at your local computer store, or

★ Call our **toll-free** number: **1-800-227-1617, ext. 564** (In California, 1-800-772-3545, ext. 564) and charge it to your VISA or MasterCard, or

★ Use the order form below. Send your check (payable to MICRO) and the form to: MICRO, Dept. OA, P.O. Box 6502, Chelmsford, MA 01824.

QTY	ITEM	PRICE EACH	COST
_____	**MICRO on the Apple 2**	@ $24.95	_____
_____	**MICRO on the Apple 1**	@ $24.95	_____
_____	**What's Where in the Apple?**	@ $14.95	_____
_____	**MICRO** (U.S.)	1 yr @ $24; 2 yrs @ $42	_____
_____	**MICRO** (Foreign)	1 yr @ $27	_____
		Subtotal	_____
		Massachusetts residents add 5% sales tax	_____
		Add $2 **per book** for shipping	_____
		MICRO Journal excluded Allow 4-6 weeks for delivery.	
		TOTAL	_____

☐ Check enclosed ☐ Charge my credit card below

Name _____

Company _____

Street _____

City _____ State ZIP _____

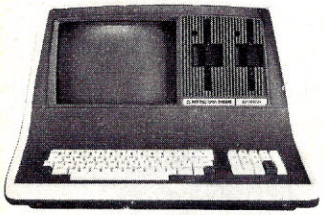
☐ VISA ☐ MasterCard

Signature _____

Card Number _____ Expiration Date _____

BRAINS-MAINFRAMES

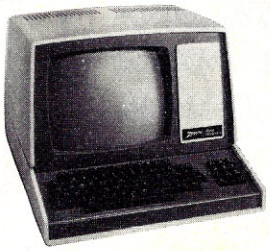
SUPERBRAINS



SUPERBRAIN QD 64K

List $3995 . . . . . only $2949

ZENITH

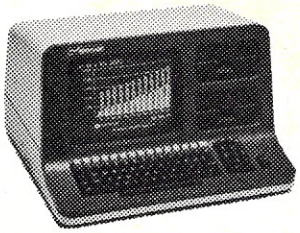


Z-89 48K
List $2895 . . . . . only $2099
Z-90 64K DD 3195
ONLY $2489

COMPUSTARS
Available to Dealers

ADVANTAGE

NORTH STAR



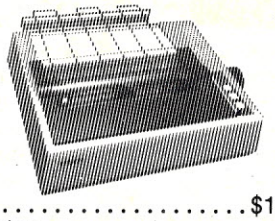
Minicomputer Performance

Green Phosphor Options:
Graphics + CP/M
List $3999
Only $3199

ZENITH Monitor Green Phosphor $118

TERMINALS Z-19 . . . . . $718
INTERTUBE III Super Smart $710

EPSON



MX-80 FT. $598
MX-80 . . . . . $474
MX-100 . . . . . $749

ANADEX 9501 . . . . . $1290
NEC Letter Qual Friction & Tractor . . . . . call
ZENITH printer Z-25 list 1595 only $1256
STARWRITER letter qual FT $1824

ATARI

ATARI 400 . . . . . List $399 . . . . . only $340
800 . . . . . List $899 . . . . . only $675

Wonderful Games—Education for your family

Main Frames - S-100 . . . . . $200 up
Single Board Computer 64K . . . . . $ 749
6800-CPU S-100 . . . . . Call us . . . . . Save cash!

AMERICAN SQUARE COMPUTERS is organizing a World Wide Association of Computer Dealers. Open a Store or Start Work Out of Your Home! We Charge NO FRANCHISE FEE! (Our Competitors charge a FRANCHISE FEE of from $15,000.00 to $45,000.00.) Be a Winner! Let US help YOU get started MAKING MONEY by HELPING PEOPLE to put COMPUTERS to WORK. Write or Phone today.

TELEVIDEO TERMINALS . . . 910 $518, . . . 925 $739

GODBOUT COMPUPRO
Super Sixteen 8085/8088 is the fastest combo 8/16 CPU. LIST . . . . . $3904 . . . . . Special $3269

SEATTLE'S
16 bit COMPUTER is here! 8 MHz 8086 CPU the fastest S-100 computer! 128K Static RAM, DD Disk Controller, 22-slot Main Frame, 86-DOS, #2 128K
LIST . . . . . $4185 . . . . . ONLY $3349
#1 As above but 64K LIST . . . $3190 . . . ONLY 2649

CALIFORNIA COMPUTER 2210A
LIST $2350 . . . . . ONLY $1895
Z80, 64K, I/O, Disk controller + CP/M.
Model 300-1A is the larger system: 2.4 Mb 8" Z80, 64K, and optional OASIS, CP/M, or MP/M operating system.
LIST . . . . . $5695 . . . . . ONLY $4995

SYSTEMS GROUP SYSTEM 2800
Runs CP/M or OASIS. Supports single user & multi-user & multi task. Up to 5 megabytes with 8" drives. Optional 10-megabyte hard disk. Optional tape back up #2812 $5035 . . . . . ONLY $3775

TARBELL'S
Empire I&II have two 8" disk drives. The I is single sided, the II is double sided.

FREE Business Software
Empire I LIST $4888 . . . . . Only $3666

We sell The Finest Hardware

AMERICAN SQUARE COMPUTERS

We sell The Finest Software

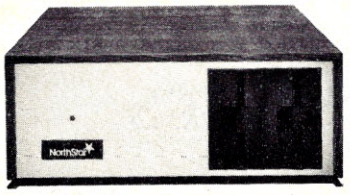
56

919-889-4577 4167 Kivett Dr. Jamestown, NC 27282 919-883-1105

CP/M is a registered trademark of Digital Research, Inc.

LOWEST PRICE·BEST QUALITY

NORTH STAR Horizon 2



2-5¼" Disk Drives
64K Double Density
Factory assem. & tested
Factory guaranteed

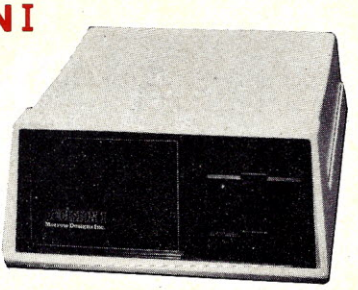
A few left
Low Price only
$2499

Powerful North Star BASIC Free
Superb for Business & Science

HORIZON STANDARD IS NOW HRZ-2-64K QUAD

Factory Assembled & Tested	List	Only
Horizon-2-32K-Double Density		$2349
Horizon-2-32K-Quad Density		$2549
Horizon-2-64K-Quad	$3599	$2699
Horizon-2-64K-QHD 5	$5999	$4499
Horizon Ram ASM	32K=$374	64K=$524
Big Sale on Multi-User Time-Sharing		call
English to Basic Translator		$99
North Star Hard Disk 18 Mb	$5375	$3923
North Star Time Sharing Multi-User		call
Zbasic 2 to 5 times faster!	$350	call
Secretary Word Processor		$99
Wordstar Word Processor		$318
Floating Point Board	$399	$319
Oasis Multi-User Software	SAVE	call
CP/M for N* Extra features	$230	$220
Micro Mike Software	SAVE	call
Ecosoft Accounting $355	MICROSTAT	$265
Pascal-80	$600	$515
Extra Precision Basic		$50
Northword	$199	$179
Mailmanager	$299	$224
Infomanager	$399	$349
General Ledger	$499	$429
Accounts Receivable	$499	$429
Accounts Payable	$499	$429
Inventory	$499	$429
Order Entry	$499	$429
PROPAC	$1499	$1274
DOS + Basic 5.2		27

DECISION I



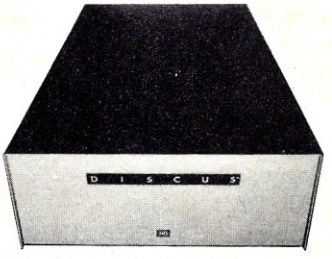
"The IBM-360 on the Z-80 & S-100 BUS!"

Sixteen Programs running simultaneously! Free CPM, Microsoft BASIC and WORDSTAR with Complete system!

	LIST	ONLY
DECISION 1 + 65K Static + 8" Disks	$4375	3500
DECISION 1 + 65K Static + 2 - 5" Disks	4195	3356
DECISION 1 + 65K Static + 5" Disk + 5 Mb Hard Disk	5990	4792
DECISION 1 3 user 195K Static + 5" Disk + 5Mb Hard Disk + MICRONIX	8035	6428
DECISION 1 — Z-80 + 1/0=Power	1725	1339

MORROW 8" Disk

Discus 2D + CP/M 600K only $849
Discus 2 + 2 + CP/M 1.2 MEGA B. $1149
Add Drives 2D = $599 2 + 2 = $795
Discus 2D-dual + CP/M Only $1388
Free Microsoft BASIC from MORROW with Discus system or hard disk



M-26 MORROW Hard Disk
26,000,000 Bytes!!
List $4495 ..... Only $3395
Free CPM + BASIC
M-20 List $4795 .. Only $3835
M-10 List $3695 .. Only $2955
M-5 List $2495 .. Only $1995

InterSystems

Z-80A CPU 4 MHz
64K Dynamic RAM
Front Panel

VI/0-1 - with interrupts
FDCII Disk Controller
20 slot motherboard

List $3795 ..... Only $2839

Without front panel as above only $2716
Front Paneless Recommended for Business

Save on Memory and Programs

Systems Memory 64K A&T $459
Systems Memory 64K Bank $555
Microangelo $985

Corvus Hard Disk ..... SAVE
SSM Video BRD VB3 kit $361
Spectrum Color ASM $326

Cat Novation Modem $169
Memory Merchant 16K $159

Which Computers are Best?—FREE. Insured Shipping at Low Rates. Call For Latest Prices, Details. We Beat Advertised Prices.

Factory Guarantees *Expert Advice*

AMERICAN SQUARE COMPUTERS

919-889-4577 4167 Kivett Dr. Jamestown N.C. 27282 919-883-1105

56

®CP/M is a registered trademark of Digital Research, Inc.

Find out what you can do to preserve the integrity of your micro's data.

A Shocking Look At Voltage Suppressors

By G. Michael Vose
Microcomputing Technical Editor

Are you the kind of person who thinks that a spike is something a wide receiver does with a football after he scores a touchdown? Or do you believe that a spike is a special kind of heel on shoes worn by the truly elegant and fashionable? Maybe spike makes you think of the Golden Spike that united a continent's railroad system, or maybe it brings to mind what you do to the punch at the company Christmas party each year. I propose to expose you to yet another kind of spike.

This spike is electrical in nature. It comes in two forms—transients and surges. Spikes of electrical current transmitted along ordinary power lines can potentially cause difficulty for sensitive solid-state devices like computers. Therein lies the importance of this story about voltage spikes, radio frequency interference (rfi), electromagnetic interference (emi) and electromagnetic pulses (emps).

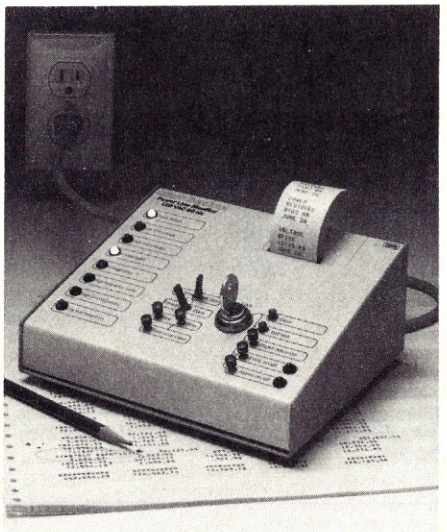
The Integrity of Data

As the modern home and office become increasingly reliant on the speed and efficiency of computers for record keeping and data manipulation, data integrity becomes critical. Floppy disk storage of large amounts of important data demands reliability from the computer hardware. The speed and convenience of disks is of no advantage if the failure rate of disk read or write operations is high. The integrity of the computer's memory is similarly critical. If an office manager spends a great deal of time recovering from errors that result from seemingly random memory failures, the gains in efficiency provided by the computer are lost—along with the sanity of the operator.

In 1982 the state of the microcomputer art is such that the hardware itself is very reliable. The quality of the training provided for computer operators is a variable in the reliability formula. Another variable, not often recognized, is the quality of the support environment in which the computer is located. One of the few things that the computer needs from the outside world is electrical power—clean, uninterrupted power. Unfortunately, traditional sources of electrical power are seldom clean and uninterrupted.

Power Problems

Electrical power can be suspect for a variety of reasons. Interference may be transmitted along utility power lines or it may be generated within a building or room by a number of sources. The kinds of electrical interference that can affect computer devices include voltage above or below the normal voltage for the system (called spikes, transients and surges, dips, sags or brownouts); and noise interference (often called "hash" by electrical engineers). According to studies by the Institute of Electrical and Electronics Engineers (IEEE), harmful power line disturbances occur, on average, four times a day. Of the disturbances, 88 percent are power spikes (transients and surges), 11 percent are brownouts (low voltages) and 0.5 percent are power outages.



The Glitch Sentinel GS-2 from Billings McEachern. Sounds an alarm and prints a record of every power line disturbance. Filters voltage imbalances and noise. $900.

The difference between transients and surges is strictly one of duration and degree. A transient is a voltage increase to 6000 volts or higher lasting 100 μs or less. A surge usually lasts slightly longer but is characterized by voltages of 3000 volts or less. Voltage surges of 1000 volts are common, everyday occurrences in most industrial and commercial electrical environments.

The most common causes of electrical interference are voltage imbalances generated by electrical machinery. A refrigerator motor or a furnace blower motor can cause voltage spikes and voltage reductions during operation. Other causes of interference include the obvious, like lightning, and the not-so-obvious, such as sunspots.

Spikes and Sags

What kind of damage is caused by increased or decreased voltage? Per-

manent damage seldom occurs to a computer as a result of voltage fluctuation. It *is* possible, in the case of an extraordinary event such as a lightning strike, for sensitive semiconductor devices (such as computer memory chips and microprocessors) to experience circuit melting, corrosion, arcing (which will break down insulation) and a reduction in component life. In mechanical devices, such as disk drives, pitting and metal transfer among switch contacts are possible.

Far and away the most common effect of voltage transients on computing devices, however, is alteration of memory. Small voltage fluctuations can be interpreted by low-power computer circuitry as legitimate input signals. Therefore, it is possible to experience random memory errors as a direct result of electrical interference.

Semiconductor memory chips contain circuitry that comprises hundreds of individual memory cells. These cells are composed of field-effect transistors which act as gates that can either be open or closed, coupled with capacitors that store an electrical charge. During the cycling of the microcomputer's clock, the central processing unit (CPU) writes data to memory at regular intervals. During a write operation, the transistor that acts as a gate is opened and a small electrical charge (for a binary 1) or no charge (for a binary 0) is stored in the accompanying memory cell capacitor. Then the gate is closed.

> The most common effect of voltage transients on computing devices is alteration of memory.

If the data to be written is subjected to a spike or surge during the write operation, a memory capacitor could be set high instead of low. Since a character of information, or byte, is stored simultaneously one bit per chip over eight chips in each 16K of memory, an entire byte of memory could be written incorrectly. If this happened to be a vital byte, an entire data block could be rendered unusable.

Equally critical is the effect of overvoltages on disk drive units. Since the read/write head in a floppy disk drive is designed to alter magnetic fields, voltage spikes often cause the head to alter the data on a disk even when the head is engaged in a read operation. These alterations will occur randomly; however, since the disk reads the directory more than other tracks on a disk, the probability that a random glitch will alter the directory is high. When this occurs, the entire disk becomes unusable.

Voltage spikes are most likely to occur from the switching on or off of an electric motor. Copy machines, elevators, air conditioners, printing presses, furnaces, etc., all generate voltage spikes. These spikes are experienced within the building where the equipment is located, and are transmitted to all parts of the building along the electrical wiring. Low voltage, commonly called a dip or sag, often occurs as a 5–20 percent voltage reduction lasting about a second, and results from a sudden call for power by an electrical device. Low voltages can cause the picture on a television screen or video monitor to shrink visibly for a brief moment. Commonly, low-voltage periods are followed immediately by a high-voltage surge as the system draws power from the outside to satisfy the needs of its consuming devices.

Brownouts are long-term voltage reductions, typically 5–8 percent. They usually are gradual in nature and may last from several minutes up to several hours. Brownouts are initiated by the utility supplying the power, usually due to equipment failure or excessive demand by the power grid. Because they occur gradually, brownouts seldom cause difficulty in computers since the power transformer in the computer adjusts the incoming power to suit the needs of the system. These transformers are ideally suited to accommodating gradual power fluctuations.

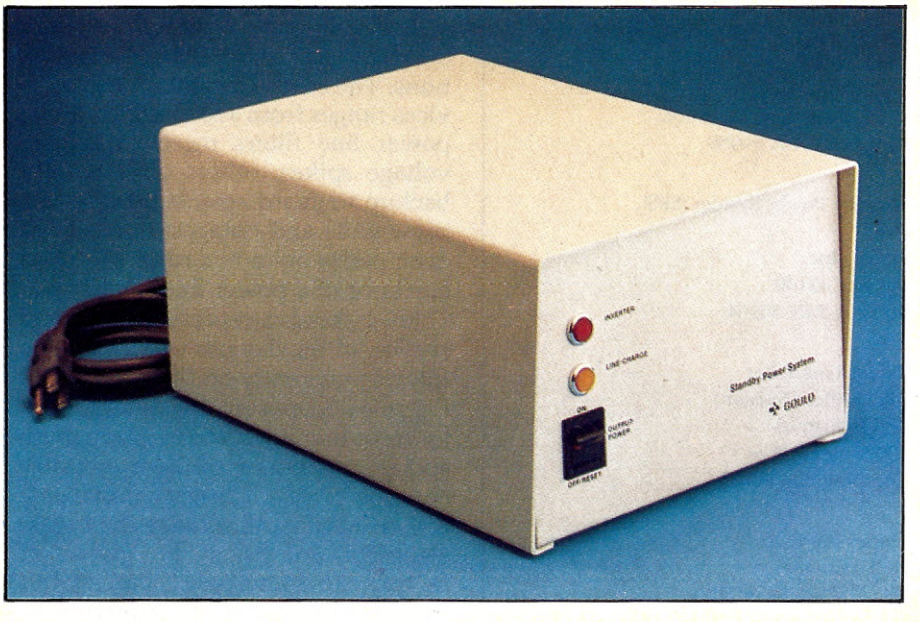
Noise Interference

Voltage fluctuations are the more serious of the two kinds of electrical interference, but noise interference comes in a greater variety of forms. This interference is simply an unwanted electrical signal, and could be as unobtrusive as a jolt of static electricity. Anyone who has ever worked in a computer room without antistatic carpet knows that static electricity can cause data loss in computers.

The common forms of noise are:

- Radio frequency interference (rfi) caused by the reception of electromagnetic signals by power lines acting like antennas.
- Electromagnetic interference (emi) caused by a fluctuating magnetic field such as that produced by an operating electric motor.
- Electromagnetic pulse (emp) caused by a collapsing magnetic field such as lightning. Static electricity is an emp.

Noise interference occurs at lower magnitudes than voltage spikes and is, consequently, less dangerous to equipment. However, it can more frequently degrade performance and cause data loss in computers. This is



The Gould Stand-By Power System. Powers a microcomputer for up to 20 minutes if power is lost or if voltage drops below 102 V. $489.

1. Voltector and Voltector Multibus Strip
$79.50
Pilgrim Electric Co.
29 Cain Drive
Plainview, NY 11803

2. Super Isolator
$95
Electronic Specialists, Inc.
171 Main St.
Natick, MA 01760

3. Genisco C Filter
Genisco Technology Corp.
18435 Susana Road
Rancho Dominquez, CA 90221

4. Multi-Outlet Power Strips
$43.97–$73.95
MFJ Enterprises
PO Box 494
Mississippi State, MS 39762

5. Spike-Spiker Mini-I and Mini-II
Kalglo Electronics Co.
6584 Ruch Road
East Allen Township
Bethlehem, PA 18027

6. Isolator (Iso-1, 2, 3, 4, and Iso II)
$62.95–$106.95
Electronic Specialists, Inc.
171 Main St.
Natick, MA 01760

7. MayDay
$240 and up
Sun Research, Inc.
Box 210
New Durham, NH 03855

8. Lemon, Lime, Orange, Plum
$49.50–$139.95
Electronic Protection Devices
41 Sun St.
Waltham, MA 02154

9. Power Master Line Filters
SGL Waber Electric
Dept. W
300 Harvard Ave.
Westville, NJ 08093

10. HDA Power Master
Automated Systems, Inc.
5265 Port Royal Road
Springfield, VA 22151

11. EFI Filter/Suppressor
$400–$800
Electrical Filters, Inc.
PO Box 9087
2147 East 3300 South
Salt Lake City, UT 84109

12. Clipstrip and Clipper
Line Voltage Transient Suppressors
DyMarc Industries, Inc.
7133 Rutherford Road
Baltimore, MD 21207

13. The Voltage Surge and Transient Suppressor
Cuesta Systems, Inc.
3440 Roberto Court
San Luis Obispo, CA 93401

14. LF2 and LF6
R.L. Drake Co.
540 Richard St.
Mimisburg, OH 45342

15. Power Line Filter (26-1451)
$49
Radio Shack
(All Radio Shack stores)
Ft. Worth, TX 76102

16. RAMLOK
Ladco Development Co.
PO Box 464
Olean, NY 14760

17. ZTA and ZTD Filters
Power Integrity Corporation
300 East Wendover Ave.
Suite 102
PO Box 9682 Plaza Station
Greensboro, NC 27401

18. Quiet Line 6
$39.95
BWJ Technology
Box 6214 Dept. 8
Arlington, TX 76011

19. Glitch Guard POP
TII Electonics Division
1375 Akron St.
Copiague, NY 11726

20. Glitch Sentinel (GS-1, GS-2, GS-3)
$300–$900
Billings McEachern, Inc.
333 Cobalt Way, Suite 106
Sunnyvale, CA 94086

21. Standby Power System (SPS)
$489
Gould, Inc.
PO Box 43140
St. Paul, MN 55164

22. Power Line Filter
J.W. Miller Division
Bell Industries
19070 Reyes Ave.
Compton, CA 90221

23. Model CN-1110
DoAll Company
Des Plaines, IL 60016

Table 1. Power line filtering equipment.

because noise interference occurs at extremely high frequencies and high speeds. The response time for most power transformers is not fast enough to trap these high-speed signals.

Noise can be generated by many common devices such as fluorescent lights, radio and television transmitters, electric typewriters, hand tools, automobile ignition systems and sunspots. Computers themselves generate some rfi, and their electrical components, like disk drive motors and power supplies, generate emi. Loose electrical connections and damaged power cords are other sources of noise.

What Can You Do About Spikes and Noise?

The obvious solution to the problem of "dirty" power lines is to incorporate some sort of filter into the distribution system. In much the same way that an oil filter extracts impurities from your car engine's motor oil as it courses through the block, a power line filter can knock down voltage transients and eliminate noise. This is done using circuitry specially designed to handle the offending voltage fluctuations.

The obvious solution to the problem of "dirty" power lines is to incorporate some sort of filter into the system.

Power line filters come in a variety of types, sizes and voltage configurations. The cost spectrum for these devices ranges from $20 to $2000. Some power line filters merely dissipate voltage spikes; others offer battery backup to guard against power sags, brownouts and outages; one system even prints out a record of every occurrence of a power line fluctuation. Table 1 shows a representative cross section of the devices for power line filtering currently on the market.

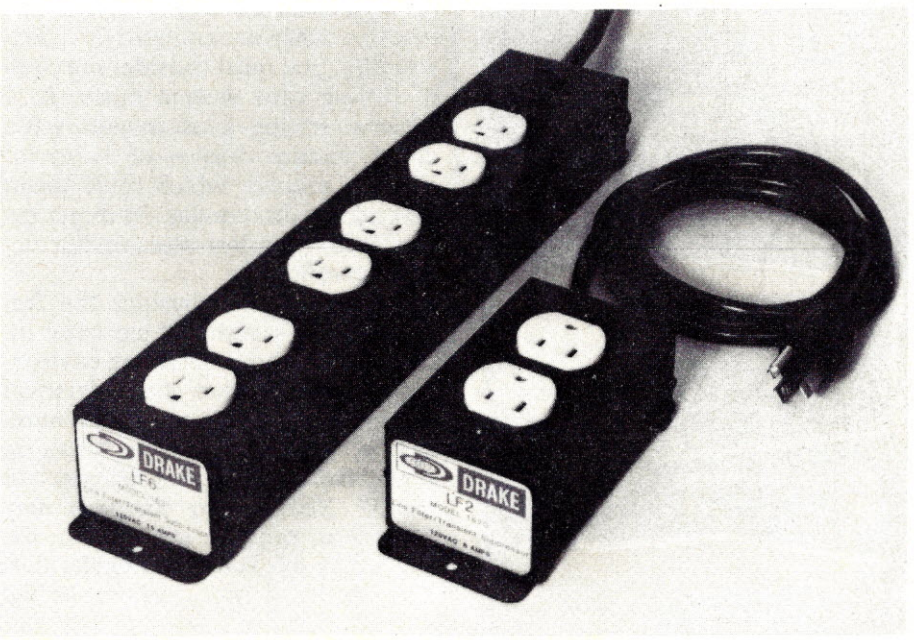
Typically, power line filters work by rerouting unwanted voltage (both spikes and noise) through circuitry equipped with electrical components called varistors that cause the excess electrical energy to be given off as heat. In some cases, part of this excess energy may be diverted to the main electrical system's grounding loop.

Power line filters should be installed between the main source of power and the device to be protected. Normally the power line filter plugs into a wall receptacle and then your computer plugs into the filter. Many filters have an on/off switch so that the circuit can be turned off when your machinery is not in use.

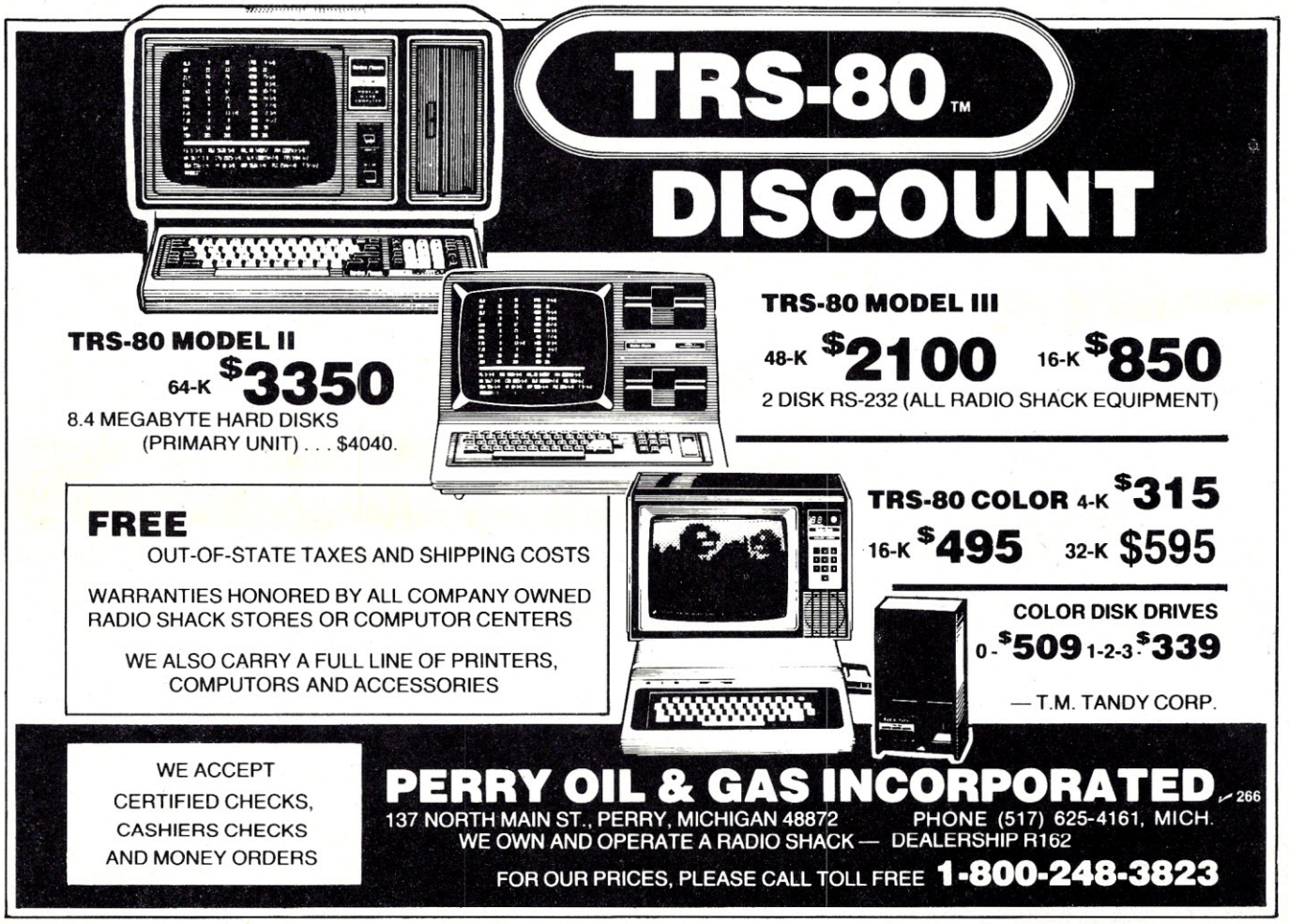
The principal qualities to consider in a power line filter are the overvoltage handling capacity, the response time and the frequency range for noise suppression. Usually a low-cost filter will offer only minimal protection. In fact, the lower-priced filters may offer overvoltage protection only, with no noise suppression capability. Only the most expensive filters offer battery backup for protection in the event of a brownout or power outage.

The overvoltage handling capacity of power line filters ranges from 1000 V to 12,000 V. A capacity of 5000 V will usually protect the line from any spike other than a lightning strike. Many manufacturers call this capability the clamping voltage—this refers to the maximum voltage that will be clamped, or suppressed, by the device.

The response time of power line filters typically ranges from 5 to 15 nanoseconds (1 nanosecond is 1×10^{-9} seconds). Noise reduction frequency response is usually in the range of 150 kHz to 30 MHz. Some devices are rated as high as 200 MHz. Unless your building is near a microwave transmission site such as a TV station or a radar installation, an up-



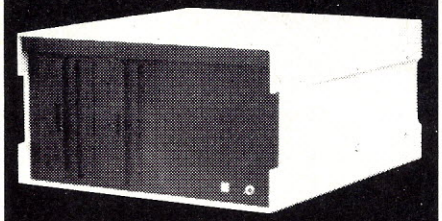
The LF2 (right) and LF6 line filters from R.L. Drake. $39.95 and $59.95.



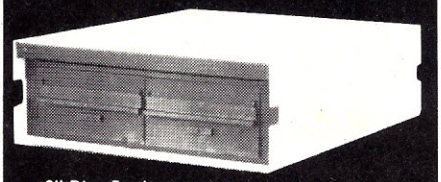
See List of Advertisers on page 130

Main/Frames
Main/Frames
from
$200

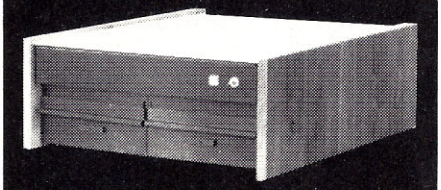
- 30 Models of Enclosures
- Assembled and tested
- Quasi-Coax Motherboards
- Power Supply
- Card cage and guides
- Fan, line, cord, fuse, power & reset switches



8" Floppy Main/Frame



8" Disc Enclosure



Phase/80 8" Floppy Mainframe

Phase/80 Desk + Mainframe

Write or call for our brochure which includes our application note: "Building Computers — A Recipe"

INTEGRAND

8620 Roosevelt Ave. • Visalia, CA 93291
209/733-9288

We accept BankAmericard/Visa and MasterCharge

↙77

per level of 20 to 30 MHz of protection should be sufficient.

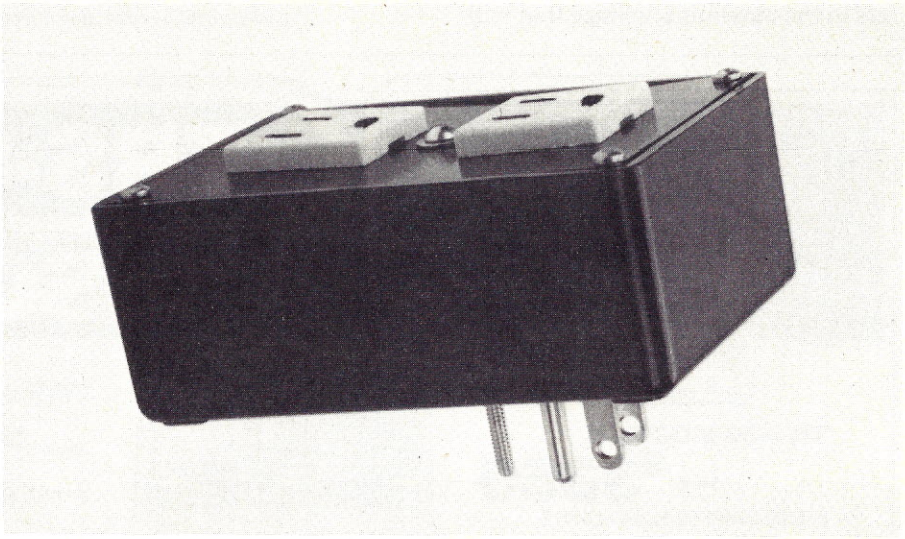
Picking the Right Filter

The line filter that you choose for your particular application will depend on several factors. Principal among these is the investment you've made in hardware and software. Secondarily, you must consider the costs of having your system crash. In a business setting, a lost inventory file could require dozens of hours of labor to rebuild, which could mean several hundred dollars in direct expenditure plus lost sales and/or decreased efficiency.

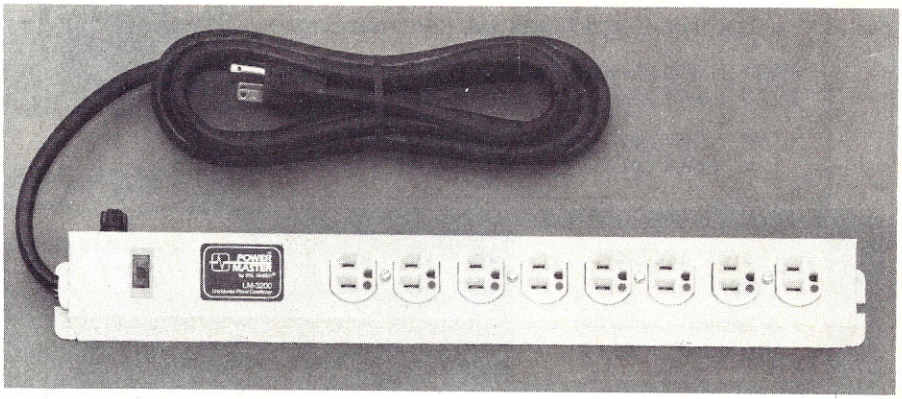
You must also consider the frequency and severity of electrical interference in your operating environment. The condition of the electrical wiring in your building and the number of electrical devices drawing power from the system are important factors. Your power company may be able to produce statistics on the frequency of voltage irregularities. The electrical specifications of the power supply in your computer will reveal the degree of its susceptibility to electrical interference. The manufacturer can usually provide this information.

Finally, you will want to consider the aesthetics of the variety of units on the market. Some unobtrusive devices plug directly into a wall socket, while others feature a multiple-socket design arranged in a so-called power strip. Others are housed in boxes of varying size and color that become part of your computer installation.

Ultimately, you may decide that your computer functions well enough in its present environment. The extra expense of another piece of hardware may be unnecessary. On the other hand, if your machine seems possessed by demons that spontaneously and randomly chew up data or spit out garbage, you may want to consider cleaning up your supply of electricity. Sending nasty notes to the power company is optional.■



Direct Plug Isolator from Electronic Specialists. A spike suppressor only. $96.95.



Power Master Line Filter from SGL Waber. Model LM3200 with a 9-foot, 10-inch power cord.

DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIV

PRICE BREAKTHROUGH

Super Sale on DISK DRIVES

was ~~$299.95~~ • now only **$199.95** complete!!
40-track, double/single density

for

RADIO SHACK — HEATH — ZENITH
& MOST OTHER COMPUTERS
(with power supply and case)

ORDER NOW • SUPPLY IS LIMITED

"FREE SHIPPING"

Diskettes (box of 10)	**$25.00**
2 Drive Cable	**$25.00**
4 Drive Cable	**$35.00**

TOLL FREE ORDERING
1-800-343-8841

SPRING SPECIAL
Two Drives in Our New Expanding Case
$349.95!!
We welcome MC/Visa, C.O.D. and personal checks at no extra charge.

Warrantee — 90 day limited warrantee with automatic repair extension.

SOFTWARE SUPPORT

294

ONE STALKER LANE, FRAMINGHAM, MA 01701
(617) 872-9090

FREE SHIPPING IN CONTINENTAL U.S.

*TRADEMARK TANDY CORPORATION

ES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES

ES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIV

Business Is Our Business

Gene Cayot, Sales Manager, MSI. . .

We have been building commercial quality computer systems for 11 years now. . . a lot longer than most companies in our industry. Our reputation for quality and reliability has been firmly established in over twenty different countries where MSI Business Systems are sold.

Let me tell you more about MSI and our business systems. . .

With MSI you get a lot

more than just hardware.

Technical Support

We offer the finest and most extensive customer support of any company in our industry. Our systems are equipped with modems which permit our technical support staff to perform system diagnostics and file maintenance remotely via telephone lines. Our company aircraft allows support personnel to be at the customer's site within a few hours if necessary.

Expandability

Our systems do not have built-in obsolescence. Any MSI computer system can be expanded to run in multi-user mode, with large capacity hard disk drives, and with our business software. MSI systems can grow, as your business grows, to meet your needs.

Customer Training

We hold seminars at selected locations around the country which provide training in all areas of MSI system operations — from installation to the use of our business software.

Business Is Our Business

Our business software modules are designed for "real world" business use. We offer complete audit trail files for all changes to the data base, complete history files, and general ledger posting files. Back-up routines provide maximum protection of the data files on removable disk cartridges.

Let MSI help your business run better

If you have a problem in inventory control, bills of material, order entry/accounts receivable, general ledger, or cost accounting — give me a call personally for more information on an MSI Business System.

MSI Midwest Scientific Instruments

↙144

220 West Cedar • Olathe, Kansas 66061

913-764-3273

TWX 910 749 6403 • TELEX 437049

↙See List of Advertisers on page 130

You can pocket $50 by following this author's instructions in assembling the ZX81 kit.

Exploring Sinclair's Tiny World

By Jerry Martin

I first became interested in the ZX81 when I saw several two-page ads in a computer magazine. I had heard a few things about the ZX80 but had never taken the time to investigate it because of the price and limited memory. But the ZX81 stood out because it had Basic in ROM (read-only memory) and, while still limited to 1K bytes of programmable random-access memory (RAM), could be expanded with a 16K memory module. Information stored in RAM is only in existence as long as the computer has power. ROM is always there and can only be read. So when the ZX81 is turned on it immediately executes the Basic interpreter program stored in ROM, and you're ready to start entering your Basic programs.

What really got my attention was the price—$149.95 for an assembled unit and only $99.95 for a kit. I have always wanted to put a computer together, but I don't have the electronic know-how to design one myself or do my own breadboarding.

Being one who reads the fine print, I looked very closely at the Sinclair ad. It stated that the ten-day money-back guarantee and the limited 90-day warranty, which includes free parts and labor through Sinclair's national service-by-mail facilities, does not apply to kits. So I had to decide whether I was willing to gamble my assembly capabilities for a savings of $50. I would also have to give up the ten-day evaluation period in which I could get my money back.

As I've stated, I'm not an electronic genius. I've put together several Heath-type kits, the most complicated being an FM stereo receiver. But I decided to give it a whirl and sent my $99.95 (plus $4.95 for shipping).

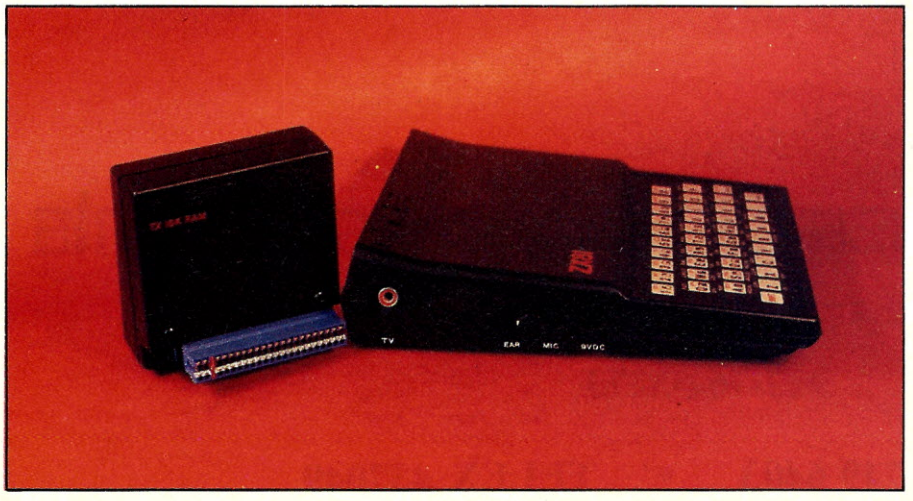
First Impressions

When the computer arrived, I received my first shock—it was so tiny! Photo 1 will give you an idea of the size. It measures 6½ inches wide by seven inches long and is about 1½ inches deep at the back, tapering down to only ¾ of an inch at the front.

The keyboard is six inches wide and 2½ inches from front to back. The keyboard is a nonglare plastic membrane. Photo 2 shows a closeup of the entire keyboard held in the palm of my hand. The keys are arranged in the normal typewriter (QWERTY) manner, and are 7/16 of an inch wide and 5/8 of an inch apart from the center of one key to the center of the next. At first glance this seems to be a bit close but in practice it works out quite nicely. Photo 3 gives a good illustration of the relative size of the keys and their separation.

Now for the nitty gritty—what is it like to put together? Well, it's not too bad. First let's take a look at what you

Jerry Martin (3192 Hiawatha, Columbus, OH 43224) is the coordinator for workshops at the Ohio State University Instruction and Research Computer Center.



The ZX81 uses a standard home television for display and a tape cassette recorder for program storage. A 16K RAM attaches to the back of the computer.

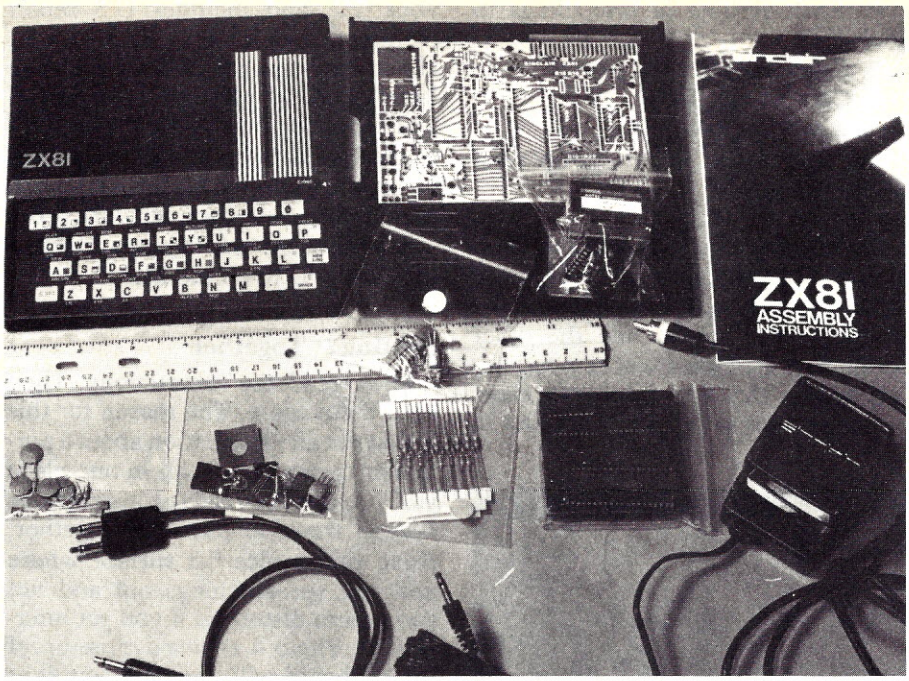


Photo 1. Components, parts and instruction manual contained in the ZX81 kit.

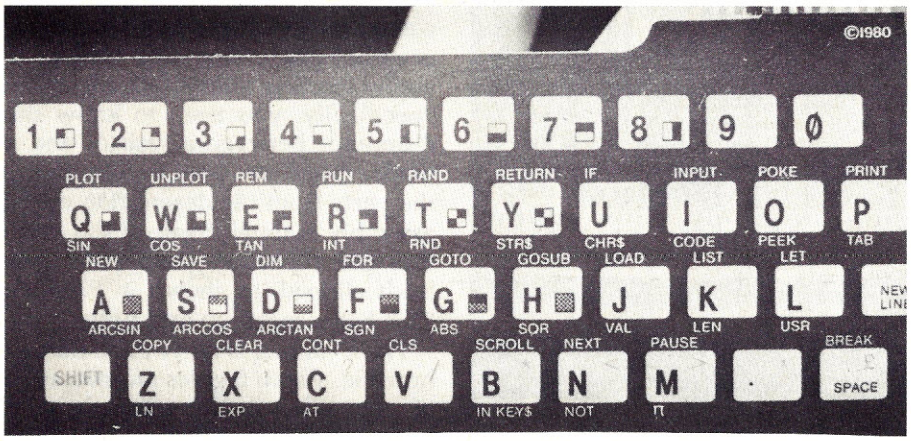


Photo 2. The ZX81's flat keyboard membrane.

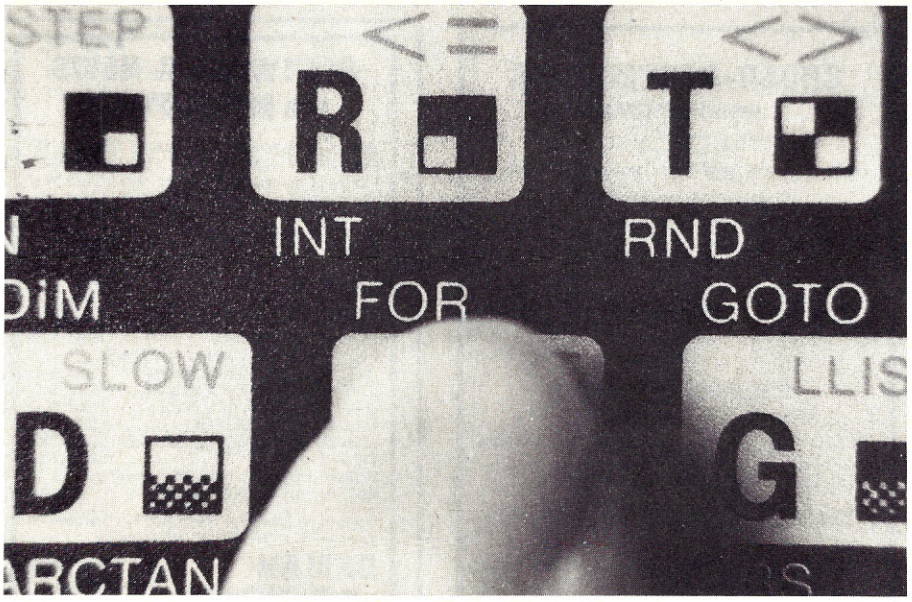


Photo 3. While the keyboard is small and the keys close together, it is still easy to use..

receive in the kit. The major components, being the case and the keyboard, are shown in the upper left part of Photo 1. The white lines above the upper right hand side of the keyboard are very thin plastic cables containing the contacts that plug into the circuit board. The white lines are actually thin strips of copper set in the plastic to form the keyboard cable.

In the upper middle of Photo 1 is the printed-circuit (PC) board with the bottom half of the computer case below it. The ZX81 assembly manual is at the upper right and the power supply is directly below. Cables for the cassette recorder and a connector between the computer and the TV modulator (not shown) are along the bottom of the photo. A handful of parts are strung out in the middle, each in their individual ziplock plastic packages. The five integrated circuits (ICs) are in the packet just to the left of the power supply. Also included, but not shown, is a 164-page ZX81 Basic programming manual which I found to be very good. It is well-written, with a number of examples that aid in understanding the text.

The instruction manual is basically a parts list. The kit includes:

31 resistors
2 resistor packs
12 capacitors
5 integrated circuits
2 transistors
8 diodes
1 ceramic filter

The instructions tend to be brief. For instance, they read "We suggest you assemble the components in the following order:

"i) resistors, capacitors, and IC sockets

"ii) the diodes and transistors. . ." Heathkit instructions they are not, but diagrams show how the major components are installed and the PC board has all the components clearly marked as to where, for example, capacitor C1 goes. All you need to do is identify capacitor C1 (the markings are indicated in the parts list) and install it in the appropriate place. It is necessary to read the instructions through before starting assembly. If you don't, you will be sorry. I did and I was still sorry, but more about that later.

The instructions are broken into seven major categories:

1. Preparation (what you will need)
   a. 15 to 20 W soldering iron

b. Resin solder
c. A pair of sidecutters
d. A small phillip's head screwdriver
e. I also found needle nose pliers handy

2. Precautions (don't zap your ICs with static electricity)
3. Component identification
a. If you know the difference between a transistor and a diode this should not be a problem
4. Circuit board assembly (brief but adequate)
5. Testing (check your soldering)
6. Fault finding (a few things to look for)
7. Case assembly (no sweat)
8. Component list
9. Power supply
10. Service (if you mess up send $20 to fix it)

There were also two minor amendments, one indicating an error in the polarity marking of a capacitor on the printed-circuit board and the other indicating the placement of a resistor needed for U.S. kits. A separate sheet explains how to connect the ZX81 to your TV, and includes U.S repair facilities and prices, some more about kits (important information here!), and the address for technical assistance or spare parts. There were also a few pointers for ZX80 owners on how to clean the PC board if a 16K memory module does not work properly and where to find more information in the U.S. on the ZX81.

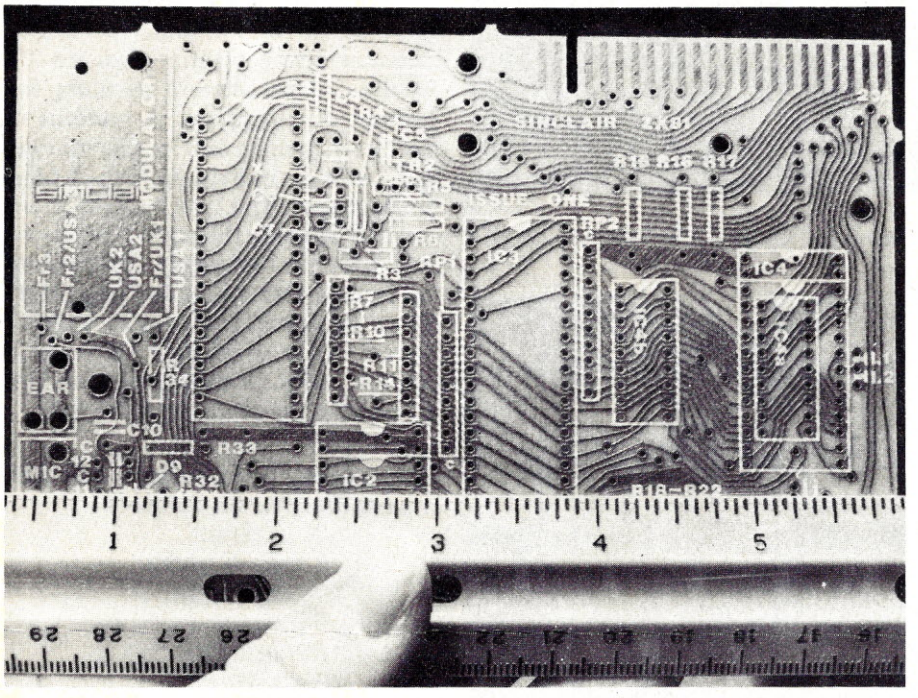


Photo 4. The parts are outlined and identified on the PC (printed-circuit) board.

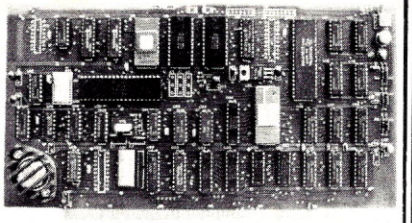
Putting It Together

First, read the instructions. Then read them again. The reason for this is that not all information about a particular component is all in one place and you need to read the instructions several times to put it all together. Next, find a nice flat surface where you can spread things out and not have them disturbed if you get interrupted. Photo 4 shows a close-up of the PC board with the parts' outlines shown on the board itself. This is the side the parts are mounted on. Just identify, from the parts list, which component is C4 and put it in the appropriate place. This is not difficult if you're familiar with electronic parts. Specifically, you need to know the difference between a resistor and a diode. I had no trouble identifying the parts from the description in the assembly manual. Some of the resistors and capacitors even have their leads clipped, as shown in Photo 5. This helps speed up assembly.

The soldering is fairly close but not horrible. Photo 6 gives an indication of the side of the printed-circuit board that you solder. The solder

NEW! S-100 BUS COMPATIBLE

SINGLE BOARD COMPUTER WITH VIDEO OUTPUT



USES:
This card can function as a stand alone single board computer or a S-100 intelligent video interface card.

FEATURES:
4 MHZ Z-80A*, up to 8K of EPROM, up to 4K Static RAM, two 8-BIT input ports, one 8-BIT output port, one 8-BIT sense input port with interrupt, composit video output (80x24), video attributes (reverse video, underline, blinking), graphic capabilities using SMC CRT 5037 and CRT 8002.

PRICE:
Bare board with documentation $49.95
Monitor and video terminal software (in EPROM) $45.00
Source listings (with Monitor purchase) $15.00
Hard to find Parts Kit (crystal and fuse link PROM's) $13.00
CALIFORNIA RESIDENTS ADD 6% TAX

EMS Educational Microcomputer Systems ✓57
*Registered Trademark of Zilog, Inc
P.O. BOX 16115 IRVINE, CA. 92713-6115

CROSS-ASSEMBLERS
written in FORTRAN IV

NOW AVAILABLE: two different cross-assemblers for each of the following microprocessors

6800 6801 6805 6809 68000 8080/85 6502 1802

* Two-pass assembly, allowing forward references
* Manufacturer's complete instruction set
* Long error messages, free-format input
* Written in 1966 ANSI standard FORTRAN IV
* "Industrial" Macroassemblers also feature macros, conditional assembly, and relocatable object code

(Target Machine (s))	"HOBBYIST" ASSEMBLERS	"INDUSTRIAL" MACROASSEMBLERS
6809 or 6502	$200.00	$400.00
Other 8-bit	150.00	350.00
16-bit	250.00	500.00

SOURCE CODE TRANSLATOR PROGRAMS

6800, 6801, 6805 to 6809	$100.00
6502 to 6809	175.00

Prices include source code on tape and in printed form. User's Manual, shipping (USA), and program support. All programs shipped from stock.

***SPECIAL ON PREPAID ORDERS: Same-day EXPRESS MAIL shipping, for no extra charge. Call to order today--your program will arrive tomorrow!

IDM INTELLIGENT DEVICES OF MINNESOTA
P.O. Box 492 Anoka, MN 55303
(612) 427-0787 8:00 AM-12:00 Noon
✓209

SOFTWARE & NEWS FOR MICROPOLIS

MDOS & CP/M. For use on Micropolis S-100 drives. VG, EXIDY, COMPAL, CDS, SOL, IMSAI, POLY, BLACKHAWK. Distributor for most S/W vendors. Micropolis S/W is also compatible with some TANDON & TEAC drives.

Dozens of Programs, Languages, Util's., Applic's., Games ..... **Cat. $2**

	List	Sale
SPELLBINDER	$495	$319
d BASE II	$695	$589
PONY-PICK	$300	$252
BASIC/S & Z Compilers	$345	$308
UTL-1: Set of 9 MDOS utilities, incls MDOS to CP/M, CP/M to MDOS translator	$ 95	$ 85
SORT/A, SORT B MDOS-CP/M assm lg	$ 75	$ 67
REACT: Reminder- Activity (MDOS)	$50	$ 42
TEXTWRITER: (MDOS&CP/M)	$125	$110
BOOKKEEPING in MpBASIC or BASIC-80	$250	$189
MAILSYS I (MDOS)	$ 50	$ 37
MICROPOLIS USERS GROUP, Mthy news'r yr		$ 18
MUG Lib. diss, 11 MDOS Vols. ea		$3 to $15

Products postpaid to N. Amer. Add $7 elsewhere. All funds in U.S. dollars. VISA & MC accepted.

DAMAN (205) 881-1697
Ste. 202, 604 Springwood Cir/Huntsville, AL 35803

points are about two millimeters apart. The ruler is in centimeters and each centimeter is equal to ten millimeters. This side of the board is masked with a green plastic overcoating, so the chance of solder bridges with the dense circuit traces is reduced. The soldering is really quite simple and should not pose a problem if you have some experience with soldering on printed-circuit boards.

Helpful Hints

Pick out all of the resistors, put them in and solder them. Most go flat but some have to be inserted upright. See Photo 7 for a close-up of how the upright ones are installed. The assembly manual also shows how these are to be installed.

Next install the two resistor packs. These are two long narrow things, one with nine leads and the other with six leads. They are referred to as RP1 and RP2, respectively. Here is where I messed up. These must be installed with the black square (or white dot) oriented toward the C mark on the PC board. This is one case where the instructions were not where I would have expected them to be. I installed both backwards and, let me warn you, once you have put them in don't hold any hope for taking them out undamaged!

Fortunately, Columbus, OH, has a very well-stocked electronics distributor, and I was able to replace them for only $1.13. However, I could not locate a nine-lead pack, and had to buy a ten-lead instead. I cut off one lead and put tape around it to prevent any contact with the PC board. If you look closely at Photo 8, in the middle just to the right of the large IC marked D780C-I, you can see the tape I placed on the tenth pin of the resistor pack. That IC, by the way, is the Z-80A microprocessor.

Next install the capacitors, ceramic filter, transistors and diodes. Photo 9 shows a close-up of the orientation of the diodes. The wide band should be toward the top as shown.

Next to last comes the keyboard power and cassette connectors, volt-

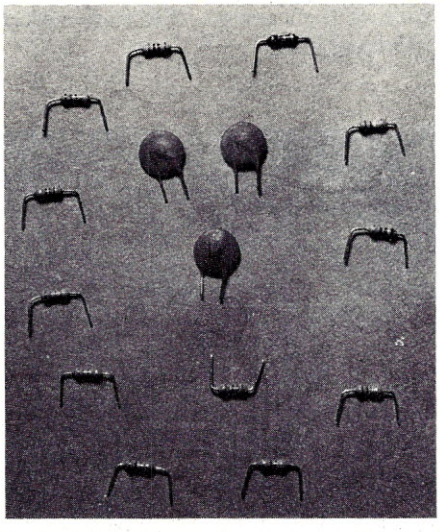


Photo 5. Capacitors (the circular ones) and resistors used in the ZX81.

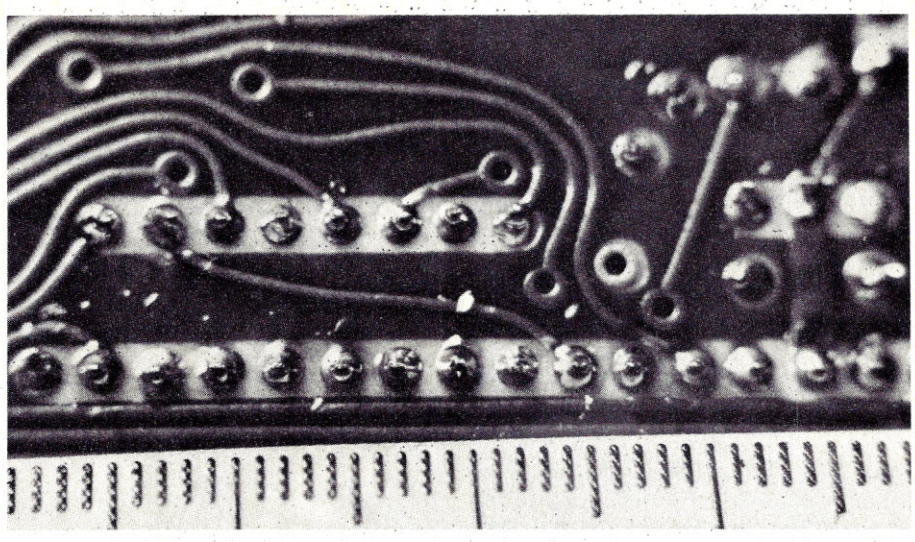
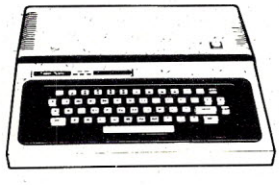


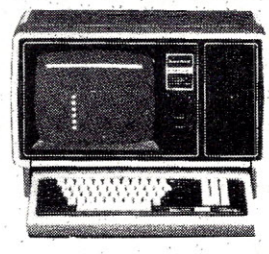
Photo 6. Solder points on the back of the PC board are about 2 millimeters apart as the centimeter ruler indicates.

AUTHORIZED TRS 80® DEALER #R491



TRS-80® Color Computer With Extended Color BASIC

26 – 1062
Model III 16K RAM
Model III, BASIC
$839.00



26 – 4002
Model II, 64K

WE ACCEPT CHECK, MONEY ORDER, OR PHONE ORDERS WITH VISA OR MASTERCARD. SHIPPING COSTS WILL BE ADDED TO CHARGE ORDERS. DISK DRIVES, PRINTERS, PERIPHERALS, AND SOFTWARE—YOU NAME IT, WE'VE GOT IT. WRITE OR CALL FOR OUR COMPLETE PRICE LIST.

C & S ELECTRONICS, LTD. 32 EAST MAIN ST. MILAN, MICH. 48160

79 (313) 439-1508 (313) 439-1400

C & S ELECTRONICS MART IS AN AUTHORIZED TRS 80® SALES CENTER STORE #R491

See List of Advertisers on page 130

500 K Great Reasons to Buy Your Diskettes from Snappware!

Byte for byte, performance counts. Every byte of data you record is important. That's why Snappware offers Scotch diskettes, the highest quality diskette on the market at very competitive prices. Scotch diskettes are tested and quaranteed error-free. And the low abrasivity saves your read/write heads.

Scotch Brand 744-0
5¼ inch single sided, single density, soft sectored with hub rings.

One box	$23.00/box
Five boxes	$22.50/box
Ten boxes	$22.00/box
Twenty boxes	$21.50 box

Scotch Brand 744D-0
The premium grade mini-floppy. Double density certified, with hub rings. The very finest available for your Model III.

One box	$27.00/box
Five boxes	$26.50/box
Ten boxes	$26.00/box
Twenty boxes	$25.50/box

Scotch Brand 741-0
Eight inch single sided, double density soft sectored. The very finest available for your Model II.

One box	$33.00/box
Five boxes	$32.00/box
Ten boxes	$31.00/box
Twenty boxes	$30.00/box

When it comes to diskettes, we have the best price per byte.

Authorized Distributor 3M Information Processing Products

SNAPPWARE
SNAPPWARE

Time saving power at your fingertips.

CALL TOLL FREE:
1-800-543-4628
OHIO RESIDENTS
CALL COLLECT: (513) 891-4496
3719 Mantell
Cinti., Ohio 45236

age regulator and integrated-circuit sockets. The sockets should be oriented with the notch in the same direction as the printed-circuit board indicates. Photo 10 gives a close-up of how the voltage regulator is installed.

Next comes the modulator. Be sure to double-check the connections on the modulator before you solder it. The connectors should go to the UK1 and UK2 holes (see the upper left of Photo 4). Now you can insert the ICs in their sockets. The integrated circuits need to have their pins bent to fit in the sockets. Beware of static electricity when handling the ICs, as they are the most expensive and sensitive items in the ZX81 computer.

Look at Photo 8 for the placement of the ICs. Starting from the left there are two small chips; these are the RAM chips. Note that the left one has an outline for a larger IC. The ZX81 was designed to be able to use two ½K ten-pin RAMs (shown), one 1K 24-pin IC or a 2K IC. At present only the 1K ICs are supplied with the ZX81 but as the price drops the 2K chips may be used without having to change the circuit board.

The third IC to the right is the large 40-pin Z-80A microprocessor which is the brain of the ZX81. The next IC to the right and slightly up is the 8K Basic ROM. In my kit this is a 24-pin IC, but a 28-pin socket is provided. (In Photo 4 right above my thumb you can see that the IC2 marking has two sizes shown.) If the IC is smaller than the socket, it goes toward the edge of the printed-circuit board as Photo 8 illustrates. The last integrated circuit has 40 pins and is the Sinclair's I/O (input/output) logic IC, which takes care of the cassette, TV and printer I/O functions.

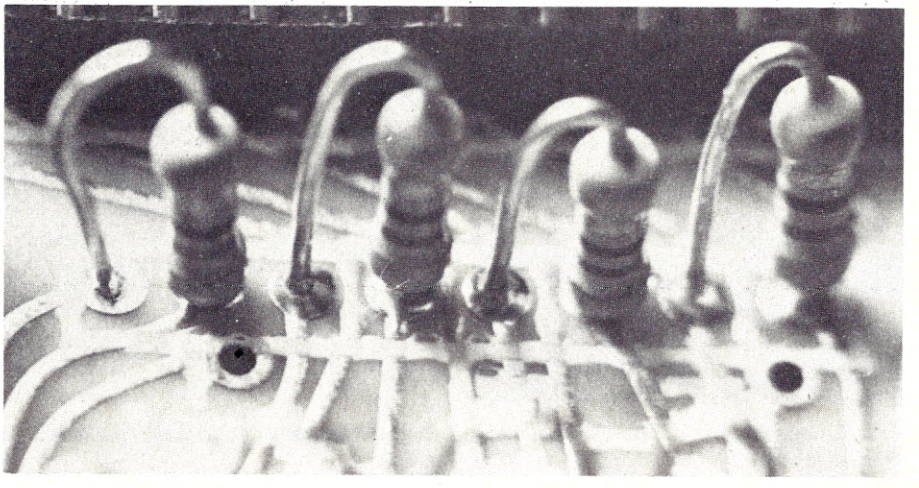


Photo 7. While most resistors are installed flat on the PC board, a few (as shown) are installed on end.

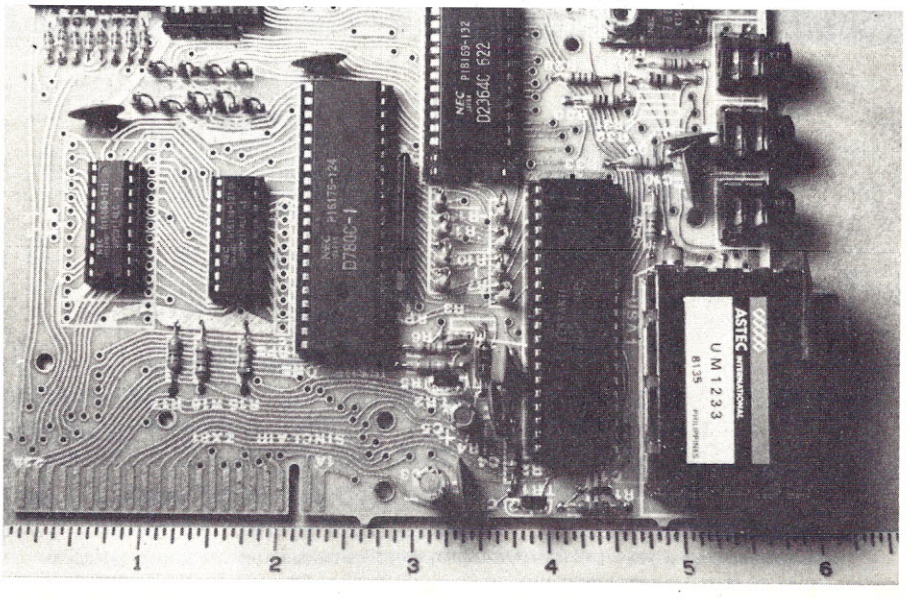


Photo 8. Completed PC board.

NEW! TPM* for TRS-80 Model II
NEW! System/6 Package
Computer Design Labs

Z80* Disk Software

We have acquired the rights to all TDL software (& hardware). TDL software has long had the reputation of being the best in the industry. Computer Design Labs will continue to maintain, evolve and add to this superior line of quality software.
— Carl Galletti and Roger Amidon, owners.

Software with Manual/Manual Alone

All of the software below is available on any of the following media for operation with a Z80 CPU using the CP/M* or similar type disk operating system (such as our own TPM*).

for TRS-80* CP/M (Model I or II)
for 8" CP/M (soft sectored single density)
for 5¼" CP/M (soft sectored single density)
for 5¼" North Star CP/M (single density)
for 5¼" North Star CP/M (double density)

BASIC I

A powerful and fast Z80 Basic interpreter with EDIT, RENUMBER, TRACE, PRINT USING, assembly language subroutine CALL, LOADGO for "chaining", COPY to move text, EXCHANGE, KILL, LINE INPUT, error intercept, sequential file handling in both ASCII and binary formats, and much, much more. It runs in a little over 12 K. An excellent choice for games since the precision was limited to 7 digits in order to make it one of the fastest around. $49.95/$15.

BASIC II

Basic I but with 12 digit precision to make its power available to the business world with only a slight sacrifice in speed. Still runs faster than most other Basics (even those with much less precision). $99.95/$15.

BUSINESS BASIC

The most powerful Basic for business applications. It adds to Basic II with random or sequential disk files in either fixed or variable record lengths, simultaneous access to multiple disk files, PRIVACY command to prohibit user access to source code, global editing, added math functions, and disk file maintenance capability without leaving Basic (list, rename, or delete). $179.95/$25.

ZEDIT

A character oriented text editor with 26 commands and "macro" capability for stringing multiple commands together. Included are a complete array of character move, add, delete, and display function. $49.95./$15.

ZTEL

Z80 Text Editing Language - Not just a text editor. Actually a language which allows you to edit text and also write, save, and recall programs which manipulate text. Commands include conditional branching, subroutine calls, iteration, block move, expression evaluation, and much more. Contains 36 value registers and 10 text registers. Be creative! Manipulate text with commands you write using Ztel. $79.95/$25.

TOP

A Z80 Text Output Processor which will do text formatting for manuals, documents, and other word processing jobs. Works with any text editor. Does justification, page numbering and headings, spacing, centering, and much more! $79.95/$25.

MACRO I

A macro assembler which will generate relocateable or absolute code for the 8080 or Z80 using standard Intel mnemonics plus TDL/Z80 extensions. Functions include 14 conditionals, 16 listing controls, 54 pseudo-ops, 11 arithmetic/logical operations, local and global symbols, chaining files, linking capability with optional linker, and recursive/reiterative macros. This assembler is so powerful you'll think it is doing all the work for you. It actually makes assembly language programming much less of an effort and more creative. $79.95/$20.

MACRO II

Expands upon Macro I's linking capability (which is useful but somewhat limited) thereby being able to take full advantage of the optional Linker. Also a time and date function has been added and the listing capability improved. $99.95/$25.

LINKER

How many times have you written the same subroutine in each new program? Top notch professional programmers compile a library of these subroutines and use a Linker to tie them together at assembly time. Development time is thus drastically reduced and becomes comparable to writing in a high level language but with all the speed of assembly language. So, get the new CDL Linker and start writing programs in a fraction of the time it took before. Linker is compatible with Macro I & II as well as TDL/Xitan assemblers version 2.0 or later. $79.95/$20.

DEBUG I

Many programmers give up on writing in assembly language even though they know their programs would be faster and more powerful. To them assembly language seems difficult to understand and follow, as well as being a nightmare to debug. Well, not with proper tools like Debug I. With Debug I you can easily follow the flow of any Z80 or 8080 program. Trace the program one step at a time or 10 steps or whatever you like. At each step you will be able to see the instruction executed and what it did. If desired, modifications can then be made before continuing. It's all under your control. You can even skip displaying a subroutine call and up to seven breakpoints can be set during execution. Use of Debug I can pay for itself many times over by saving you valuable debugging time. $79.95/$20.

DEBUG II

This is an expanded debugger which has all of the features of Debug I plus many more. You can "trap" (i.e. trace a program until a set of register, flag, and/or memory conditions occur). Also, instructions may be entered and executed immediately. This makes it easy to learn new instructions by examining registers/memory before and after. And a RADIX function allows changing between ASCII, binary, decimal, hex, octal, signed decimal, or split octal. All these features and more add up to give you a very powerful development tool. Both Debug I and II must run on a Z80 but will debug both Z80 and 8080 code. $99.95/$20.

ZAPPLE

A Z80 executive and debug monitor. Capable of search, ASCII put and display, read and write to I/O ports, hex math, breakpoint, execute, move, fill, display, read and write in Intel or binary format tape, and more! on disk

APPLE

8080 version of Zapple

NEW! TPM now available for TRS-80 Model II!

TPM*

A NEW Z80 disk operation system! This is not CP/M*. It's better! You can still run any program which runs with CP/M* but unlike CP/M* this operating system was written specifically for the Z80* and takes full advantage of its extra powerful instruction set. In other words its not warmed over 8080 code! Available for TRS-80* (Model I or II). Tarbell, Xitan DDDC, SD Sales "VERSA-FLOPPY", North Star (SD&DD), and Digital (Micro) Systems. $79.95/$25.

SYSTEM MONITOR BOARD (SMB II)

A complete I/O board for S-100 systems. 2 serial ports, 2 parallel ports, 1200/2400 baud cassette tape interface, sockets for 2K of RAM, 3-2708/2716 EPROM's or ROM, jump on reset circuitry. Bare board $49.95/$20.

ROM FOR SMB II

2KX8 masked ROM of Zapple monitor. Includes source listing $34.95/$15.

PAYROLL (source code only)

The Osborne package. Requires C Basic 2.
5" disks $124.95 (manual not included)
8" disks $ 99.95 (manual not included)
Manual $20.00

ACCOUNTS PAYABLE/RECEIVABLE (source code only)

By Osborne, Requires C Basic 2
5" disks $124.95 (manual not included)
8" $99.95 (manual not included)
Manual $20.00

GENERAL LEDGER (source code only)

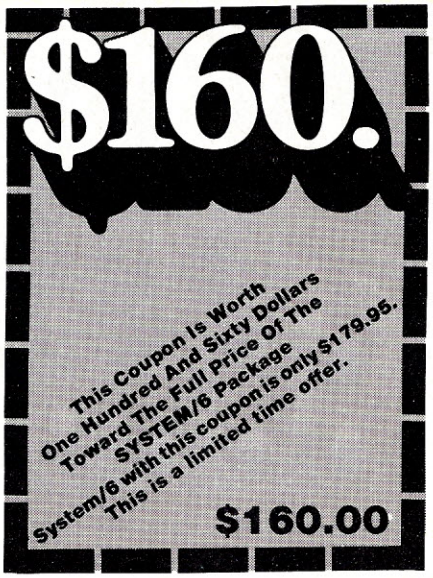
By Osborne. Requires C Basic 2
5" disks $99.95 (manual not included)
8" disks $99.95 (manual not included)
Manual $20.00

C BASIC 2

Required for Osborne software. $99.95/$20.

SYSTEM/6

TPM with utilities, Basic I interpreter, Basic E compiler, Macro I assembler, Debug I debugger, and ZEDIT text editor.
Above purchased separately costs $339.75
Special introductory offer: Only $179.75 with coupon!!



ORDERING INFORMATION

Visa, Master Charge and C.O.D. O.K. To order call or write with the following information.

1. Name of Product (e.g. Macro I)
2. Media (e.g. 8" CP/M)
3. Price and method of payment (e.g. C.O.D.) include credit card info. if applicable.
4. Name, Address and Phone number.
5. For TPM orders only: Indicate if for TRS 80, Tarbell, Xitan DDDC, SD Sales (5¼" or 8"). ICOM (5¼" or 8"), North Star (single or double density) or Digital (Micro) Systems.
6. N.J. residents add 5% sales tax.

Manual cost applicable against price of subsequent software purchase in any item except for the Osborne software.

For information and tech queries call
609-599-2146

These are NEW Toll Free numbers

For phone orders ONLY call toll free
1-800-458-3491 Ext. 15
In PA only 1-800-252-3567

OEMS

Many CDL products are available for licensing to OEMs. Write to Carl Galletti with your requirements.

* Z80 is a trademark of Zilog
* TRS-80 is a trademark for Radio Shack
* TPM is a trademark of Computer Design Labs. It is not CP/M*
* CP/M is a trademark of Digital Research

Prices and specifications subject to change without notice.

DEALER INQUIRIES INVITED.

COMPUTER DESIGN LABS

342 Columbus Avenue
Trenton, N.J. 08629

18

See List of Advertisers on page 130

The last, but perhaps the most important, step is plugging the ZX81 in to see if it works. Sometimes this is referred to as the smoke test. If it starts smoking something is probably wrong. Actually, before plugging it in you have to temporarily connect the keyboard. I found this to be the most difficult part in the entire assembly. The keyboard connectors are a very thin plastic and just did not want to go into their sockets. You can see the sockets on the upper left hand of Photo 8. It took me almost ten minutes to plug the keyboard in, and I was almost ready to cry about it. I could just see myself at the last step of assembly, not being able to plug the keyboard in the socket. After a few choice words and spreading the socket pins with my knife I was finally able to insert them. With trembling hands I connected the TV and inserted the plug into the power outlet, and surprise, surprise, it worked the first time!

It took a little fine-tuning on the TV to get things just right. The ZX81 transmits to channel 34 and there just happens to be a local TV station that transmits on the channel. It does not seem to cause an excessive amount of interference, however (see Photo 11).

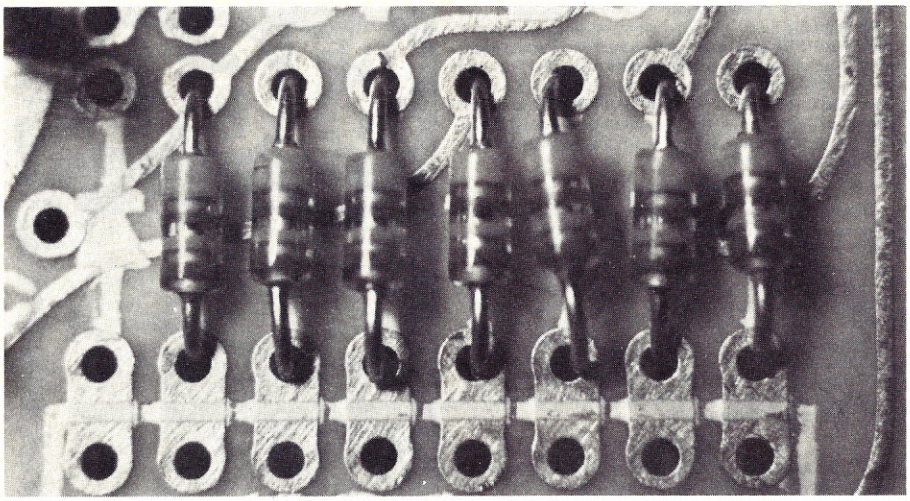


Photo 9. Diodes should be installed as shown with the wide bands toward the top of the board.

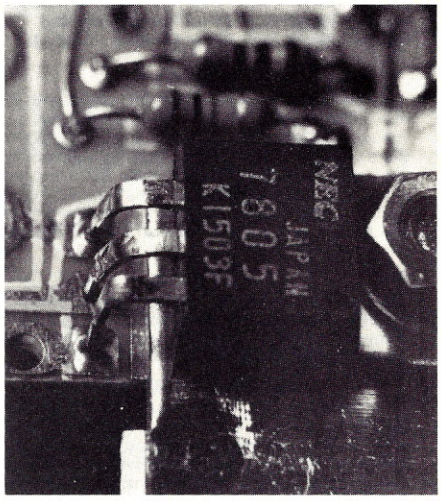


Photo 10. The installed voltage regulator.

Carbonless checks, invoices and statements

★ Standard formats...plus Custom Design Service!
★ Small quantities (as low as 500)...plus money-saving prices!
★ Super-fast service (shipped 5 days after receipt of order!)

SEND COUPON...OR CALL TOLL-FREE: 1-800-328-9697.

M5 To: Delmart Company, Division of Deluxe Check Printers, Inc., 530 N. Wheeler St., P.O. Box 43495, St. Paul, MN 55164-0495 ✓ 24

☐ **YES,** please send free color catalog!

Name _____ Title _____
Firm _____
Street _____ Phone (____) _____
City _____ State _____ Zip _____

TRS-80*

SAVE A BUNDLE

When you buy your TRS-80™ equipment!

Use our toll free number to check our price before you buy a TRS-80™ . . . anywhere!

TRS-80 is a trademark of the Radio Shack Division of Tandy Corporation

Don't Delay. . **Call Today**

HAB ✓ 189

SALES COMPANY

704 W. MICHIGAN AVE.
P.O. BOX 8098 PENSACOLA FL 32505

904/438-6507
nationwide 1-800-874-1551

The last item is, of course, putting it all together in the case and tightening the screws. The instructions are quite clear on just how this is done, and the only trouble I had was convincing myself I could insert the keyboard connectors again. Indeed, it only took half as much time.

Can You Put It Together?

If you have some experience putting together kits you should not have any difficulty assembling the ZX81. While a few points are not clear in the instruction manual, this article should help clear them up. I think the biggest problem is finding all the pertinent material about a particular component in the instruction manual.

It took me about six hours to assemble the ZX81, and that includes taking pictures and answering questions posed by a four-year old who closely monitored my progress.■

[Editor's Note: *According to Sinclair, some users have complained of intermittent problems resulting from movement of the PC board when the ZX81's case is flexed as when certain areas of the keyboard are pressed. Sinclair has already introduced a modification to remedy these problems with their kits. If you have an older kit, check with Sinclair.*

We are told that Sinclair is also planning to supply stronger cassette I/O and power supply jacks with the kits. HN]

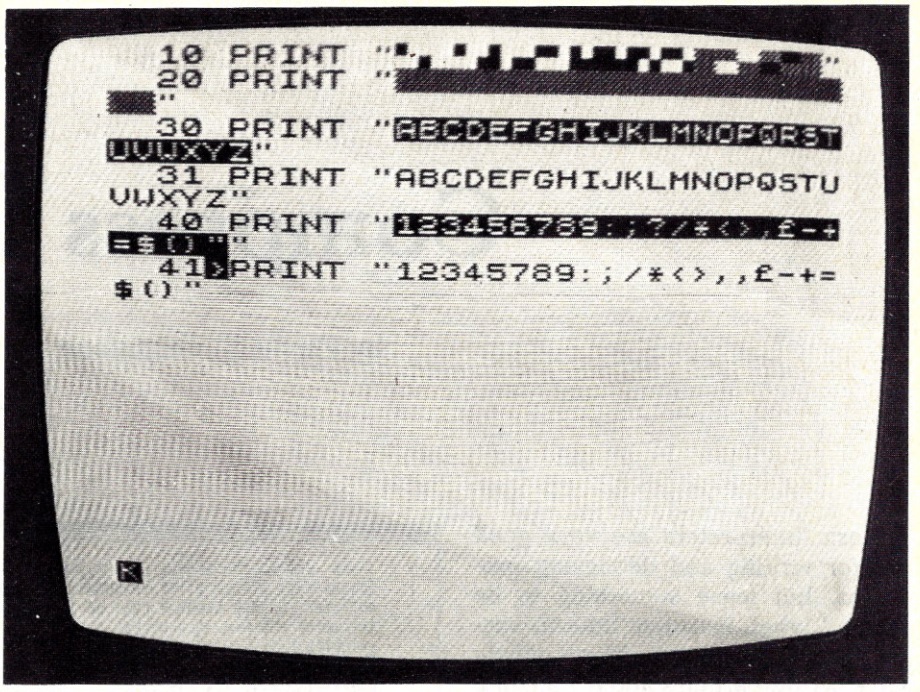


Photo 11. Video display of the completed ZX81 using a black and white TV.

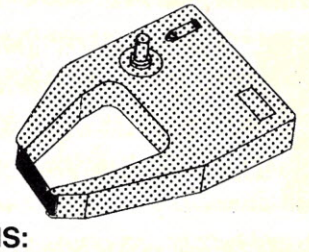
DISCOUNT PRINTER RIBBONS

40% OFF!! OR MORE!

Brand New, Top Quality, Exact Replacement Ribbons & Cartridges. These Ribbons Produce **Super Jet** Black Impressions and Ultra Reliable Print Life. They Are Delivered to Your Door Promptly for Much Less Than Most Retail Stores

★SPECIAL! BUY 10 and GET ONE FREE!

YOUR PRINTER	PACK SIZE	RETAIL LIST**	YOUR WHOLESALE PRICE		SIZE	COMMENTS	CAT. ORDER #
ANADEX **9000 Series**	1/pk.	14.00 ea	**14.00**	*(14.00 ea)*	.500"	Nylon Jet Blk	C-777
CENTRONICS 700-703, 737, 779	3/pk	18.95/3 pk	11.95/3 pk	*(3.98 ea)*	.563" x 45'	Nylon Jet Blk	C-700
CENTRONICS 100, 101A, 102, 103, 300, 301, 306, 308, 330, 358, 398, 500, 501, 503, 508, 588, 620, 820.	3/pk	26.33/3 pk	17.55/3 pk	*(5.85 ea)*	1" x 108'	Nylon Jet Blk 5 mil High Speed	C-100
CENTRONICS 704-705	1/pk	16.95 ea	13.95/Giant Cart	*(13.95 ea)*	5/16" x 210'	Giant Cart	C-7045
DEC ½ x 40YD.	3/pk	17.77/3 pk	12.95/3 pk	*(4.32 ea)*	1/2" x 120'	Double Spools	R-600
DEC ½ x 60YD.	3/pk	20.12/3 pk	14.25/3 pk	*(4.75 ea)*	1/2" x 180'	Double Spools	R-644
DIABLO HYTYPE II (M/S BLK) HI YIELD. FITS 70 PRINTERS!	1/pk	9.31 ea	6.87 ea	*(6.87 ea)*	5/16" x "High Yield"	300,000 plus imp.	C-511
EPSON MX70/80	1/pk.	16.00 ea	16.00 ea	*(13.95 ea)*	.500"x60'	Nylon Jet Blk	C-522
IBM - "SILVER DOLLAR" Sys. 34, Sys. 32 MDLA, Series IMDL4974, 5256, 3287, 3770, 3771-3774, 4974, 5100, 5103, 5110, 5228, 5256, 5320MDLA	5/pk	5.80 ea	14.90/5 pk	*(2.98 ea)*	9/16" x 30'	Nylon Jet Blk	R-300
IBM - HARMONICA ½". SERIES I. MOD 4973/II, 3200, 3289, MOD 2.	3/pk	9.42 ea	20.85/3 pk	*(6.95 ea)*	1 2" x 108'	Nylon Jet Blk	C-350
NEC SPINWRITER	4/pk	23.40/3 cart	23.60/4 pk rb. reload	*(5.90 ea)*	1/2" x 51'	Nylon/Ex Lng Life	R-400
QUME (FITS 80 PRINTER MODS)	3/pk	18.00/3 pk	13.95/3 pk	*(4.65 ea)*	1/4" x 310'	Multistrike Film	C-525
RADIO SHACK DAISY WHEEL II	1 pk	24.95/3pk.	**8.25**	*(8.25 ea)*	.250"	Mylar Multistrike	C-789
RADIO SHACK LPIII, LPV	one/pk	13.95/cart	8.95/Reload rib. only	*(8.95 ea)*	.500" x 45'	Nylon Incl Instr	R-T3
RADIO SHACK LPII, LPIV	3/pk	18.95/3 pk	11.95/3 pk	*(3.98 ea)*	.563" x 45'	Nylon Jet Blk	C-700
TELETYPE MOD 33, 28, 35, 37, 38, 88.	10/pk	2.40 ea	13.90/10 pk	*(1.39 ea)*	1/2" x 36'	Nylon Jet Blk	R-450
WANG M/S. 5541W, WC, 5581, WD, 6581W, 2281W	1/pk	6.85 ea	5.95 ea	*(5.95 ea)*	5/16" x 393'	Multistrike Film	C-550



TERMS:

MINIMUM PURCHASE - **$20**
PAYMENT BY: C.O.D. (UPS), CHECK, MASTER CARD, OR VISA CHARGE CARD.
VOLUME DISCOUNTS:
20 - 50 PACKS **10%**
51 - 100 PACKS **15%**
***UNDER $20, ADD $5 HANDLING.**
****APPROX. RETAIL. PRICE VARIES.**

ANCIE LABORATORIES
5200-J Philadelphia Way 301-345-6000 (Wash. D.C. Local)
Lanham, Maryland 20706 301-792-2060 (Balto. MD Local)
800-638-0987 (National)

NAME_____
ADDRESS_____
CITY_____ STATE_____ ZIP_____

QTY CAT.# AMT.

☐ Check Enclosed
☐ C.O.D.
☐ VISA
☐ MASTER CHARGE
ACCT. # _____
EXP. DATE _____
MIN. ORDER $20
PRICES SUBJECT TO CHANGE

TOTAL _____

ANCIE Laboratories
5200-J Philadelphia Way
Lanham, Maryland 20706

✓ 187

301-345-6000 (Wash. D.C. Local)
301-792-2060 (Balto. MD Local)
800-638-0987 (National)

✓See List of Advertisers on page 130

Here's a different approach to improve memory efficiency and execution time on your North Star system.

Compress It!

By David K. Gustafson

Basic interpreters are very good for writing and debugging programs, but leave something to be desired when it comes time to execute the final program. Many people have written articles about speeding up Basic programs, but most of them are concerned with programming techniques. In this article, I will present a different approach.

Our North Star Basic system is very good, but suffers from a drawback common to interpreter Basics. If a program is written so that it can be easily read and understood, it occupies more memory than necessary and executes more slowly than necessary.

> The program will execute faster because there will be fewer lines to search and fewer characters to interpret.

With the three programs presented here, it is possible to originate, test and debug a Basic program, and then compress the program for minimum memory usage and maximum execution speed. North Star Basic uses four bytes for each line number and only one for statement delimiters. When many statements are concatenated on one line and unnecessary spaces

David K. Gustafson is the data processing manager for Abrams Aerial Survey Corp., 124 N. Larch St., Lansing, MI 48901.

```
10REM  PROGRAM TO REMOVE SPACES, REMARKS, EXTRA LINES, ETC. FROM BASIC PROGRAMS
30DIMA(132),B(256),C(132),L(500)\!"DISK WITH PROGRAM MUST BE IN DRIVE 1"
40!"DISK FOR NEW PROGRAM MUST BE IN DRIVE 2"
50!\INPUT"PROGRAM TO COMPRESS ",F$
60IFFILE(F$)=-1THEN350
70IFFILE(F$)<>2THEN360
800PEN#0X2,F$,L\F1$=F$+",2"
90IFFILE(F1$)<>2THENCREATEF1$,L,2
1000PEN#1X2,F1$\N0=1\N1=1
110READ#0,&B0\IFB0=1THEN140
120FORI=2TOB0-1\READ#0,&B\IFB=154THENGOSUB420\NEXT
130READ#0,&B9\GOTO110
140CLOSE#0\OPEN#0X2,F$\IFL9>0THENL9=L9-1\GOTO160
150READ#0,&A(0)\Z=0\N1=0
160READ#0,&B0
170A(1)=B0\IFB0=1THEN370
180FORN=2TOB0-1
190READ#0,&C(N)\NEXT\B=B0
200GOSUB1000\REM TO REMOVE EXTRANEOUS SPACES
210D=A(2)+A(3)*256\FORI=0TOL9\IFD=L(I)THENEXIT240\NEXT\REM SEARCH FOR LINE # REFERENCE
220IFB1+B0>255THEN330\REM WRITE OLD LINE & COPY NEW LINE INTO ARRAY B
230IF(A(4)=135)OR(A(4)=145)THEN340\IFA(4)=143THEN150\GOTO320
240IFA(4)<>143THEN330
250!"LINE",D," CONTAINS REMARK NOT REMOVED"\GOTO340
320GOSUB470\GOTO150
330GOSUB510\GOSUB470\GOTO150
340GOSUB510\GOSUB540\GOTO150
350!"PROGRAM NOT ON DISK #1"\GOTO50
360!F$," NOT PROGRAM FILE"\GOTO50
370GOSUB510\FORJ=2TO132\A(J)=0\NEXT
380FORJ=0TO132\WRITE#1,&A(J)\NEXT
390CLOSE#0\CLOSE#1\END
400IFZ=1THENZ=0ELSEZ=1\RETURN
410REM SUBROUTINE TO SAVE LINE # REFERENCES
420READ#0,&C,&D\I=I+2\L8=C+D*256
430IFL9=0THEN450\FORI1=0TOL9-1
440IFL(L9)=L8THENEXIT460\NEXT
450L(L9)=L8\L9=L9+1\RETURN
460RETURN
470IFB1<5THEN480\B(B1)=92\B1=B1+1
480FORI=B2TOB-1\B(B1)=A(I)\B1=B1+1\NEXT
490B2=4
500RETURN
510IFB1=0THENRETURN\B(1)=B1
520FORI=N0TOB1-1\WRITE#1,&B(I)\NEXT
530B2=0\B1=0\N0=0\RETURN
540A(1)=B
550FORN=N0TOB-1\WRITE#1,&A(N)\NEXT
560N0=0\RETURN
1000A(2)=C(2)\A(3)=C(3)\B9=4
1010FORN=4TOB-1\IFC(N)=34THENGOSUB400
1020IF(C(N)=32)AND(Z=0)AND(B>=N)THEN1050
1030B9=B9+1\A(B9-1)=C(N)
1040IFC(N)=143THENEXIT1070
1050NEXT\B=B9\RETURN
1060REM STATEMENT CONTAINS REMARK
1070IFA(4)=143THEN1100
1080B=B9-2\RETURN
1100FORT0=N+1TOB-1\B9=B9+1\A(B9-1)=C(T0)\NEXT\B=B9\RETURN
```

Listing 1. Compressed version in North Star Basic.

You've Got TOTAL ACCESS©

(specializing in TRS80 *)

TO YOUR COMPUTER HARDWARE & SOFTWARE NEEDS. CALL ROSE TODAY!

Rose©

The complete line of Radio Shack products is available through TA with standard RS limited warranty. Call me for price and delivery. Just cause you don't see it don't mean we ain't got it.
ROSE

Iv'e got

★ **DISK DRIVES**
- TA400 (40-T)..... $289
- TA800 (80-T)..... $399
- TA400 Flippy..... $319
- TA800 Flippy..... $409
- TA400-2 Dual Head..... $409
- TA800-2 Dual Head..... $549

Complete with silver enclosure & power supply. All TA Drives are MPI.

★ **CABLES**
- 2-Drive..... $23.95
- 4-Drive..... $33.95
- Extender Cable..... $14.95

★ **BARE DRIVES**
- TA400B..... $249
- TA800B..... $349
- TA400B Flippy..... $269
- TA800B Flippy..... $359

★ **EPSON PRINTERS**
- MX80..... $469.00
- MX80 F/T..... $579.00
- MX100..... $769.00
- Parallel Cables..... $24.95
- MX 70-80 Ribbons..... $12.95

★ **OPERATING SYSTEMS**
- TRSDOS 2.3 Disk & Manual.... $19.95
- LDOS..... $119.95
- NEWDOS/80..... $129.95
- DOSPLUS 3.3,3.3D..... $89.95

★ **IRON**
- Disk Drive Power Supply, Single..... $37
- Disk Drive Case (silver) and Base $19
- Memorex Diskettes (bx of 10) . $25

90 day warranty on **DRIVES.** Add $5.00 freight per drive in Cont. U.S. UPS COD charge $1.50. There is also a 15 day FREE TRIAL on TA drives. If not completely satisfied I'll refund your money (less shipping). I'll take exception to improper use or mishandling.

★ **RADIO SHACK COMPUTERS**
- 26-1061 MIII, LI, 4K..... $595
- 26-1062 MIII, LII, 16K..... $835
- 26-1065 MIII, 48K, 1 Drive..... $1695
- 26-1066 MIII, 48K-2 Dr-RS232.. $2099
- 26-3001 4K Color Computer... $315
- 26-3002 16K w/ext. Basic..... $485
- 26-3003 32K w/ext. Basic..... $566
- 26-3501 Pocket Computer.... $185
- 26-4002 MII, 64K, 1-dr..... $3288

★ **PERIPHERALS - Model I, II, III**
- 26-1140 OK Exp. Interface..... $249
- 26-1140 With 16K Mem. Tstd/Guar $299
- 26-1140 With 32K Mem. Tstd/Guar $349
- 26-1145 MI RS232 w/cable..... $85
- 26-1148 MIII RS232 w/cable..... $89
- 26-1172 D.C. Modem I..... $135
- 26-1173 D.C. Modem II..... $169
- 26-1206 CTR-80 Recorder..... $51
- 26-3008 CC Joysticks, pr..... $21
- 26-3010 13" Color Video..... $353
- 26-4150 MII 8.4MB Disk..... $3820
- 26-4151 MII Hard Disk No.2... $2970
- 16K 200nsec Memory Guar 1yr. $29

★ **OTHER PRINTERS & ACCESSORIES**
- 26-1158 Daisy Wheel II..... $1694
- 26-1455 Acoustic Cover..... $339
- 26-1447 Tractor Assy..... $208
- 26-1448 Sheet Feeder..... $1111
- 26-1165 Line Printer V..... $1581
- 26-1166 Line Printer VI..... $986
- 26-1167 Line Printer VII..... $339
- 26-1168 Line Printer VIII..... $679
- 26-1191 Flat Bed Plotter..... $1695
- 26-1195 Digitizer..... $379
- ANADEX DP-9500, 9501..... $1295
- NEC 7730 Spinwriter, 55cps.. $2484
- Daisy Wheel Printer, 45cps... $1779
- Tractor for above..... $237
- Sheet Feeder for above..... $1250
- 26-1308 Printer Stand..... $88
- 26-4302 Printer Stand..... $129
- 26-1401 or 4401 Printer Cable.. $32

★ **NEC COMPUTERS**
- PC-8001A Keyboard & Processor... ..... $1099
- PC8011A Expansion Unit..... $699
- PC-8031A 2-drive Expansion Unit..... $1099
- PC-8041A Green Phos. Video.. $225
- PC-8043A HighRes Color Mon.. $925

ROSE'S SPECIAL OF THE MONTH

★AEROCOMP'S★ ALL NEW DOUBLE DENSITY CONTROLLER "DDC" $149.95

Here's a Double Density Controller for Mod. 1 that does away with all those data separation problems that seem to keep cropping up! Rose wouldn't fun ya now, would she? Don't be scared of Double Density any more. AEROCOMP has designed some advanced circuitry that even I don't understand - but I do know it works. Better order now. Quanities are going to be a bit short.

$189.95 complete with Dosplus 3.3D. How many do you want? 12?

ZENITH MONITORS

12" Screen * Green Phosphor
This is the one you have been waiting for. Well built. Works great with the model I. Also has 40/80 column switch so the Apple folks can use it. 90 day warranty good Nationwide. Sell your old Model I monitor and be the first on your block to have a "real" green screen.
- 12" Zenith Green Phos. Mon..... $135
- Cable for Model I..... $7

★ **RADIO SHACK SOFTWARE**
I have most all R/S software instock and it can be yours at 15% off the R/S retail price. Call me for the latest availibility.

DOUBLE DENSITY DATA SEPARATOR FROM AEROCOMP $49.95

If you own a PERCOM "DOUBLER A"*, "DOUBLER II"* or "LNDoubler" ** upgrade it with the "DDS". Plugs right in. No more lock-out! You deserve one of these.

ORDER NOW! TOLL FREE 800-527-3582

Write or call ROSE TOLL FREE at 1-800-527-3582. Texas residents call 214-234-1770. Please use the toll free lines for orders and literature requests only. Technical help or service use the Texas line. Prices are mail order only. You pay by VISA or MASTERCARD, you can send check or money order (allow a couple of weeks for personal checks to clear) or order COD (we ship COD'S cash, certified check or money order only). 25% deposit required on all COD orders. Rose will take American money in just about any form. Add freight (UPS where possible) on all orders. Texas residents cough up 5% sales tax. Allow 2-4 weeks for delivery. Order today - I need the money!

TOTAL ACCESS©
P.O. BOX 3002
RICHARDSON, TX 75080

214-234-1770 ✓221

* Trademark of PERCOM DATA CO., **Trademark of LNW * TRS80 & Radio Shack are trademarks of Tandy Corp. Copyright 1981 TOTAL ACCESS

✓See List of Advertisers on page 130

Listing 2. List program.

```
10REM LISTPROG TO RUN ON N.STAR VERSION 4
20DIMA$(3)\A$=""\X9=1\X8=-1\N5=51\REM N5 = LINES PER PAGE ON PRINTER (TTY43=51)
30IFFILE("X-REF")=-1THENCREATE"X-REF",50\OPEN#1,"X-REF"
40INPUT"OUTPUT DEVICE ",U\IFU=4THEN40\LINE#U,132\N=N5\N0=1
50INPUT"PROGRAM TO LIST ",F$\WRITE#1,U,N5,F$\IFFILE(F$)=-1THEN60ELSE80
60IFFILE(F$+",2")=-1THEN1340
70IFFILE(F$+",2")<>2THEN1350ELSE100
80IFFILE(F$)<>2THEN1350
90GOSUB1290\OPEN#0%FILE(F$),F$,L\GOSUB1250\GOTO110
100GOSUB1290\OPEN#0%FILE(F$+",2"),F$+",2",L\GOSUB1250
110FORI=1TO256*L\READ #0,&A\GOSUB130\NEXT\!#U
120CLOSE#0\GOSUB1280\END
130IFA=13THEN1250
140IFA<32THENRETURN
150IFA=92THEN1230
160IF(A>31)AND(A<128)THEN170\IFZ0=0THEN!#U," ",\GOSUB180\IFZ0=0THEN!#U," ",\RETURN
170!#U,CHR$(A),\IFA=44THEN1410\IF(A=34)AND(Z0=0)THENGOSUB1390\IF(Z0=1)OR(V8=1)OR(A>90)OR(A=41)THENRETURNELSE1400
180IFA<128THENRETURN\GOSUB190\GOSUB1410\RETURN
190ONINT((A-128)/10)+1GOTO200,210,220,230,240,250,260,270,280,290,300,310,320
200ONA-127GOTO1110,590,620,610,520,770,1300,1140,780,790
210ONA-137GOTO890,900,1130,1000,1150,1030,810,820,630,800
220ONA-147GOTO1180,1160,1120,640,990,760,1260,330,830,340
230ONA-157GOTO350,360,370,380,390,400,410,430,440,450
240ONA-167GOTO460,470,480,490,500,510,530,540,600,650
250ONA-177GOTO420,980,570,1200,1040,1020,1050,550,1060,1100
260ONA-187GOTO1220,1220,1220,1220,1220,1220,1220,1220,710,1220
270ONA-197GOTO940,1220,1220,1220,930,670,1010,1090,1070,1220
280ONA-207GOTO1220,1220,730,1220,1220,1220,1220,1220,920,1190
290ONA-217GOTO1080,950,720,740,750,1170,910,1210,840,850
300ONA-227GOTO1220,860,1220,660,1220,1170,1220,1220,960,970
310ONA-237GOTO1220,700,690,680,1220,1220,870,580,880,560
320ONA-247GOTO1220,1220,1220,1220,1220,1220,1220,1220
330!#U,"CHAIN",\RETURN
340!#U,"DESTROY",\RETURN
350!#U,"CREATE",\RETURN
360!#U,"ERRSET",\RETURN
370!#U,"RUN",\RETURN
380!#U,"LIST",\RETURN
390!#U,"MEMSET",\RETURN
400!#U,"SCR",\RETURN
410!#U,"AUTO",\RETURN
420!#U,"THEN",\RETURN
430!#U,"LOAD",\RETURN
440!#U,"CONT",\RETURN
450!#U,"APPEND",\RETURN
460!#U,"REN",\RETURN
470!#U,"NSAVE",\RETURN
480!#U,"SAVE",\RETURN
490!#U,"BYE",\RETURN
500!#U,"EDIT",\RETURN
510!#U,"DEL",\RETURN
520!#U,"IF",\RETURN
530!#U,"PSIZE",\RETURN
540!#U,"CAT",\RETURN
550!#U,"NOENDMARK",\RETURN
560!#U,"NOT",\RETURN
570!#U,"ELSE",\RETURN
580!#U,"=",\RETURN
590!#U,"FOR",\RETURN
600!#U,"STEP",\RETURN
610!#U,"NEXT",\RETURN
620!#U,"PRINT",\RETURN
630!#U,"PRINT",\RETURN
640!#U,"OPEN",\RETURN
650!#U,"TO",\RETURN
660!#U,"/",\RETURN
670!#U,"SIN",\RETURN
680!#U,"<>",\RETURN
690!#U,"<=",\RETURN
700!#U,">=",\RETURN
710!#U,"SQRT",\RETURN
720!#U,"COS",\RETURN
730!#U,"ATN",\RETURN
740!#U,"LOG",\RETURN
750!#U,"EXP",\RETURN
760!#U,"WRITE",\RETURN
770!#U,"READ",\RETURN
780!#U,"GOTO",\RETURN
790!#U,"GOSUB",\RETURN
800!#U,"ON",\RETURN
810!#U,"FN",\V8=1\RETURN
820!#U,"DEF",\RETURN
830!#U,"LINE",\RETURN
840!#U,"*",\RETURN
850!#U,"+",\RETURN
860!#U,"-",\RETURN
870!#U,"<",\RETURN
880!#U,">",\RETURN
890!#U,"RETURN",\RETURN
900!#U,"DIM",\RETURN
910!#U,"(",\RETURN
920!#U,"FREE",\RETURN
930!#U,"SGN",\RETURN
940!#U,"INT",\RETURN
950!#U,"ABS",\RETURN
960!#U,"AND",\RETURN
970!#U,"OR",\RETURN
980!#U,"TAB",\V7=1\RETURN
990!#U,"CLOSE",\RETURN
1000!#U,"END",\RETURN
1010!#U,"LEN",\RETURN
1020!#U,"VAL",\RETURN
1030!#U,"REM",\Z0=1\RETURN
1040!#U,"ASC",\RETURN
1050!#U,"STR$",\RETURN
1060!#U,"INCHAR$",\RETURN
1070!#U,"RND",\RETURN
1080!#U,"EXAM",\RETURN
1090!#U,"CALL",\RETURN
1100!#U,"FILE",\RETURN
1110!#U,"LET",\RETURN
1120!#U,"EXIT",\RETURN
1130!#U,"STOP",\RETURN
1140!#U,"DATA",\RETURN
1150!#U,"RESTORE",\RETURN
1160!#U,"FILL",\RETURN
1170!#U,"TYP",\RETURN
1180!#U,"OUT",\RETURN
1190!#U,"INP",\RETURN
1200!#U,"CHR$",\RETURN
1210!#U,"^",\RETURN
1220RETURN
1230IFZ0=1THEN1240\!#U\N=N-1\GOSUB1260\!#U,TAB(10),": ",\GOSUB1410\RETURN
1240!#U,":",\RETURN
1250READ#0,&B,&C,&D\GOSUB1410\GOSUB1360\Z0=0\!#U\N=N-1\GOSUB1270\GOSUB1380\!#U,X0," ",\RETURN
1260READ#0,&B,&C\!#U,C*256+B,\GOSUB1410\RETURN
1270IFN>12THENRETURN\IFU<>0THENGOSUB1280\N=N5\GOSUB1290\RETURN
```

More →

More →

Listing 2 continued.

```
1280FORI0=NT01STEP-1\!#U\NEXT\RETURN
1290!#U,TAB(25),"PROGRAM  ",F$,TAB(60),"PAGE",N0\!#U\N=N-2\N0=N0+1\RETURN
1300READ#0,&A\IFA<>49THEN1310\!#U,"INPUT1",\RETURN
1310!#U,"INPUT ",\GOTO130
1320!#U\!#U\!#U,U0," BYTES USED OUT OF",L*256," AVAILABLE"\N=N-5
1330!#U\!#U,"PERCENT USE OF PROGRAM FILE =",%5F1,(U0+1)/(L*256)*100,"%"\IFU<>0THENGOSUB1280\GOSUB1410\!%#,\CHAIN"SORT"\END
1340!"FILE ",F$," NOT IN EITHER DRIVE"\END
1350!"FILE ",F$," NOT PROGRAM FILE"\END
1360U0=U0+B\IFB=1THEN1320\RETURN
1370REM X0 = PRESENT LINE #
1380X0=D*256+C\RETURN
1390IFV6=0THENV6=1ELSEV6=0\RETURN
1400A$=A$+CHR$(A)\RETURN
1410IFA$=""THENRETURN\A$=A$+"   "\IFASC(A$)<65THEN1430\V5=1\IFA=224THENV5=2\IFA$(2,2)="$"THENV5=3\IFA$(3,3)="$"THENV5=3
1420IFV8=1THENV5=4\!%#6I,\WRITE#1,CHR$(V5)+A$+STR$(X0)
1430V8=0\A$=""\!%#,\RETURN
```

Listing 3. Variable cross-reference sort.

```
10REM SORT OF VARIABLES TAKEN FROM NORTH STAR DISK NSSE 2 (ALPHSORT)
20DIMA$(20),B$(20)
30 REM DEVICE # 'U', LINES PER PAGE FOR PRINTER 'N7' AND PROGRAM NAME 'F$' READ FROM DATA FILE
40OPEN#0,"X-REF"\READ#0,U,N7,F$\N8=N7\W=10\W1=W-1\DIMN$(1280*(W+1))
50N=N+1\P=1+(N-1)*W\IFTYP(0)=0THEN60\READ#0,N$(P,P+W1)\GOTO50
60N=N-1\!"SORTING..."\L9=INT(LOG(N)/LOG(2)+.9)\DIML(N+L9+2)\I=0\J=N+1
70L(1)=1\L(J)=1\K2=1\IFN<=1THEN230\S1=N
80IFS1<4THEN90\K2=K2*2\B2=S1/2\S1=INT(B2)\T4=T4+(B2-S1)*K2\GOTO80
90T4=K2-T4\B2=K2/2
100IFK1=K2THEN240\T1=K1+1\K1=K1+1\B1=B2\T3=T2
110T1=T1/2\IFINT(T1)<T1THEN120\M1=M1+1\T2=T2-B1\B1=B1/2\GOTO110
120T2=T2+B1\IFS1=2THEN130\IFT3<T4THEN140\M1=-M1\GOTO150
130IFT3<T4THEN140
140M1=M1+1
150I=I+1
160L1=I\L(I)=I\L(J)=I\L0=J\J=J+1\I=I+1\L2=I\L(I)=I\L(J)=I\GOTO180
170J=J-1\L0=J-1\L1=L(L0)\L2=L(J)
180P1=1+(L1-1)*W\P2=1+(L2-1)*W\IFN$(P1,P1+W1)<=N$(P2,P2+W1)THEN210\L(L0)=L2
190L0=L2\L2=L(L0)\IFL2=L0THEN220\P1=1+(L1-1)*W\P2=1+(L2-1)*W
200IFN$(P1,P1+W1)>N$(P2,P2+W1)THEN190\L(L0)=L1
210L0=L1\L1=L(L0)\IFL1<>L0THEN180\L(L0)=L2\GOTO230
220L(L0)=L1
230M1=M1-1\IFM1>0THEN170\IFM1=0THEN100\M1=1-M1\GOTO150
240GOSUB500
250L0=N+1
260I=1\L0=L(L0)\P=1+(L0-1)*W\GOSUB340
270FORI=2TON
280L0=L(L0)
290P=1+(L0-1)*W
300GOSUB360
310NEXTI
320!#U\!#U\!#U\N8=N8-3
330GOTO400
340A$=N$(P,P+3)\X=VAL(N$(P+4,P+W1))\IFASC(A$)<>N9THENGOSUB420
350!#U,A$(2),TAB(10),%6I,X,\N6=0\RETURN
360B$=N$(P,P+3)\IFB$="    "THENRETURN\Y=VAL(N$(P+4,P+W1))\IFASC(B$)<>N9THENGOSUB410
370IFB$=A$THEN380\A$=B$\X=Y\!#U\!#U\N8=N8-2\GOSUB480\GOTO350
380IFY=XTHENRETURN\!#U,%6I,Y,\X=Y\N6=N6+1\IFN6>=19THEN390\RETURN
390!#U\!#U,TAB(10),\N6=0\N8=N8-1\RETURN
400CLOSE#0\DESTROY"X-REF"\END
410N9=ASC(B$)\GOTO430
420N9=ASC(A$)
430ONN9GOTO440,450,460,470
440!#U,"VARIABLE",TAB(15),"LINE REFERENCES"\!#U\N8=N8-2\RETURN
450!#U\!#U\!#U\!#U,"ARRAY",TAB(15),"LINE REFERENCES"\N8=N8-4\RETURN
460!#U\!#U\!#U\!#U,"STRING",TAB(15),"LINE REFERENCES"\N8=N8-4\RETURN
470!#U\!#U\!#U\!#U,"USER FUNCTION",TAB(15),"LINE REFERENCES"\N8=N8-4\RETURN
480IFN8>10THENRETURN
490FORI9=N8TO1STEP-1\!#U\NEXT\N8=N7\GOSUB500\GOSUB420\RETURN
500!#U,TAB(30),"PROGRAM ",F$\!#U\N8=N8-2\RETURN
```

Example 1. Uncompressed program dump.

```
10 DIM T(16), H$(16)
20 REM H$ = HEX DIGIT ARRAY
30 READ H$
40 DATA "0123456789ABCDEF"
50 INPUT "PROGRAM TO DUMP ",F$
60 REM CHECK FOR CORRECT FILE TYPE
70 IF FILE(F$) <> 1 THEN 340
80 OPEN #0 %1,F$,L
```

Example 1 continues.

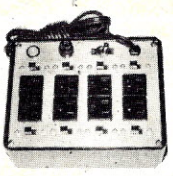
eliminated, the memory savings can be significant. The program will execute faster because there will be fewer lines to search and fewer characters to interpret.

The program in Listing 1 compresses a Basic program stored on disk, writing the compressed version as a separate file. The original program on disk drive 1 is left alone for future modifications, and the compressed version on drive 2 is available for execution after loading. The only requirement before compression is that the program be free of

SPIKE-SPIKERS™

Protect-Control-Organize

Computers & sensitive electronic equipment. Helps prevent software "glitches", unexplained memory loss, and equipment damage



PROTECTS with transient absorber & dual five-stage filter. Absorbs power line transients & filters out RFI "hash."

CONTROLS with 8 individually switched 120 vac grounded outlets. Main on-off switch, fuse & indicator light.

Deluxe Power Console
$79.95

ORGANIZE your computer & other equip. power cords. No more overloaded octopus cube taps.

2-Socket Plug-In Models

MINI-I
Transient absorber only
$34.95

MINI-II
Transient absorber plus 3-stage RFI "Hash" filter
$44.95

4-Socket Plug-In Model with Light

QUAD-I
Transient absorber only
$49.95

QUAD-II
Transient absorber plus dual 3-stage RFI "Hash" filter
$59.95

Order Factory Direct
215-865-0006
Out of State Order Toll Free
800-523-9685
PA Res. add 6%
COD Add 3.00 + Shipping
Dealers Invited

KAGLO ✓ 222
Electronics Co. Inc.
Colony Drive Ind. Park
6584 Ruch Rd., Dept. mc
Bethlehem, PA 18017

✓See List of Advertisers on page 130

Example 1 continued.

```
90 FOR I=0 TO L*256-1 STEP 16
100 ! FNH0$( INT(I/256)), FNH0$(I- INT(I/256)*256),": ",
110 FOR I0=0 TO 15
120 READ #0,&A \ REM BYTE ACCESS OF PROGRAM FILE
130 GOSUB 200
140 NEXT I0
150 GOSUB 240
160 !
170 J = 0
180 NEXT I
190 END
200 J = J + 1
210 ! " ", FNH0$(A),
220 T(J) = A
230 RETURN
240 ! "      ",
250 FOR K=1 TO 16
260 IF (T(K)>=32) AND (T(K)<127) THEN ! CHR$(T(K)), ELSE ! ".",
270 NEXT K
280 RETURN
290 REM FUNCTION RETURNS VALUE AS TWO HEX DIGITS
300 DEF FNH0$(Z)
310 H0$ = H$(Z/16+1,Z/16+1) + H$(Z-INT(Z/16)*16+1,Z-INT(Z/16)*16+1)
320 RETURN H0$
330 FN END
340 ! "FILE NOT 'GO' FILE"
350 END
```

syntax errors. Do not compress the program until it is fully debugged, since no error checking is done while compressing.

The program in Listing 2 will list the compressed version in a form that is easy to read and understand. This program also sets up a cross-reference file for variables.

The program in Listing 3 sorts the cross-reference file and prints a cross-reference to program variables. This program uses a modified version of the fast Woodruff sort which I found on North Star Users Group disk NSSE-2. This sorting technique sets up a separate link array instead of exchanging values to be sorted. Link addresses are placed in this array as values are sorted, and upon completion of the sort the values are printed by following the links in this array.

Programs 2 and 3 are chained together and form a set. Data is passed in disk file "X-REF" and the output device number is placed in memory location 0. Variable N5 on

```
10DIM T(16),H$(16)\READH$
40DATA"0123456789ABCDEF"
50INPUT"PROGRAM TO DUMP ",F$\IFFILE(F$)<>1THEN340\OPEN#0%1,F$,L\FORI=0TOL*256-1STEP16\!FNH0$(INT(I/256)),FNH0$(I-INT(I/256)*256),":
",\FORI0=0TO15\READ#0,&A\GOSUB200\NEXTI0\GOSUB240\!\J=0\NEXTI\END
200J=J+1\!" ",FNH0$(A),\T(J)=A\RETURN
240!"      ",\FORK=1TO16\IF(T(K)>=32)AND(T(K)<127)THEN!CHR$(T(K)),ELSE!".",\NEXTK\RETURN
300DEFFNH0$(Z)
310H0$=H$(Z/16+1,Z/16+1)+H$(Z-INT(Z/16)*16+1,Z-INT(Z/16)*16+1)\RETURNH0$\FNEND
340!"FILE NOT 'GO' FILE"\END
```

Example 2. Compressed program dump.

```
10  DIM T ( 16),H$ ( 16)
        : READ H$
40  DATA "0123456789ABCDEF"
50  INPUT " PROGRAM TO DUMP ",F$
        : IF  FILE  ( F$) <> 1 THEN  340
        : OPEN #0%1,F$,L
        : FOR I = 0 TO L * 256 - 1 STEP 16
        : PRINT  FN H0$ (  INT  ( I / 256)), FN H0$ ( I -  INT  ( I / 256) * 256),": ",
        : FOR I0 = 0 TO 15
        : READ #0,&A
        : GOSUB  200
        : NEXT I0
        : GOSUB  240
        : PRINT
        : J = 0
        : NEXT I
        : END
200 J = J + 1
        : PRINT " ", FN H0$ ( A),
        : T ( J) = A
        : RETURN
240  PRINT "     ",
        : FOR K = 1 TO 16
        : IF  ( T ( K) >= 32) AND  ( T ( K) < 127) THEN  PRINT  CHR$  ( T ( K)), ELSE  PRINT ".",
        : NEXT K
        : RETURN
300  DEF  FN H0$ ( Z)
310 H0$ = H$ ( Z / 16 + 1,Z / 16 + 1) + H$ ( Z -  INT  ( Z / 16) * 16 + 1,Z -  INT  ( Z / 16) * 16 + 1)
        : RETURN H0$
        : FN  END
340  PRINT "FILE NOT 'GO' FILE"
        : END

397 BYTES USED OUT OF 1280 AVAILABLE

PERCENT USE OF PROGRAM FILE = 31.1%
```

Example 3. Example 2 compressed.

line 20 of program 2 and variable N7 on line 30 of program 3 define the number of lines per page of the output printer so that the output can be paged correctly. Printed output is expanded to a maximum of 132 columns.

The three examples show a typical Basic program; in this case, a file dump program to output a machine-language Go file to the printer in hexadecimal format and ASCII. Example 1 is the dump program in original form. Example 2 is the same program compressed, and Example 3 is the compressed version listed from disk using the listing program, and includes the cross-reference to variables.

This set of programs works on North Star Basic programs written in version 4 or later Basic, but an enterprising individual could modify them for use on any disk Basic which has byte access to disk files.■

H&E COMPUTRONICS INC.

• • EVERYTHING FOR YOUR TRS-80™ • ATARI™ • APPLE™ • PET™ • CP/M™ • XEROX™ • IBM™ • •

* TRS-80 is a trademark of the Radio Shack Division of Tandy Corp. - * ATARI is a trademark of Atari Inc. - * APPLE is a trademark of Apple Corp. - * PET is a trademark of Commodore
* CP/M is a trademark of Digital Research - *XEROX is a trademark of Xerox Corp. - * IBM is a trademark of IBM Corp.

BUSINESS PAC 100

★ All orders processed within 24-Hours
★ 30-Day money back guarantee on all Software

100 Ready-To-Run Business Programs

(ON CASSETTE OR DISKETTE).....Includes 128 Page Users Manual.....
Inventory Control.....Payroll.....Bookkeeping System.....Stock Calculations.....
Checkbook Maintenance.....Accounts Receivable.....Accounts Payable.....

BUSINESS 100 PROGRAM LIST

	NAME	DESCRIPTION
1	RULE78	Interest Apportionment by Rule of the 78's
2	ANNUI	Annuity computation program
3	DATE	Time between dates
4	DAYYEAR	Day of year a particular date falls on
5	LEASEINT	Interest rate on lease
6	BREAKEVN	Breakeven analysis
7	DEPRSL	Straightline depreciation
8	DEPRSY	Sum of the digits depreciation
9	DEPRDB	Declining balance depreciation
10	DEPRDDB	Double declining balance depreciation
11	TAXDEP	Cash flow vs. depreciation tables
12	CHECK2	Prints NEBS checks along with daily register
13	CHECKBK1	Checkbook maintenance program
14	MORTGAGE/A	Mortgage amortization table
15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
71	MAILPAC	Mailing list system
72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
98	SALELEAS	Sale-leaseback analysis
99	RRCONVBD	Investor's rate of return on convertable bond
100	PORTVAL9	Stock market portfolio storage-valuation program

☐ **CASSETTE VERSION** **$99.95**
☐ **DISKETTE VERSION** **$99.95**
☐ **TRS-80* MODEL II VERSION** **$149.95**

ADD $3.00 FOR SHIPPING IN UPS AREAS
ADD $4.00 FOR C.O.D. OR NON-UPS AREAS
ADD $5.00 TO CANADA AND MEXICO
ADD PROPER POSTAGE OUTSIDE OF U.S., CANADA AND MEXICO ✓6

H&E COMPUTRONICS INC.
MATHEMATICAL APPLICATIONS SERVICE™

50 N. PASCACK ROAD
SPRING VALLEY, NEW YORK 10977

ASK FOR OUR 64-PAGE CATALOG

NEW TOLL-FREE ORDER LINE
(OUTSIDE OF N.Y. STATE)
(800) 431-2818

AMERICAN EXPRESS · VISA · master charge

24 HOUR ORDER LINE
(914) 425-1535

*** ALL PRICES AND SPECIFICATIONS SUBJECT TO CHANGE***

✓See List of Advertisers on page 130

Take your lead from this author, who developed an appropriate Pascal mechanism for tone generation on the C8P, and overcome the special problems of writing I/O interfaces in Pascal.

Pascal I/O Interfacing Made Easy

By Marc Stiegler

Structured languages such as Pascal are designed to maintain module integrity at all costs. This protection has many advantages: it prevents the programmer from clobbering modules, it prevents the modules from clobbering each other and it prevents the modules from clobbering the programmer. Since this modularity also separates the programmer from the hardware, it's easier for the application programmer to work without worrying about which hardware configuration he happened to be stuck with on an odd Tuesday.

However, this ease-of-use for applications has a penalty—it leaves a heavy burden on the systems programmer to build good, high-level I/O interfaces. And for writing such interfaces, the modular protection from hardware means that Pascal will fight him every step of the way (this may be one of the reasons that personal computer owners, who must do their own systems work, find Pascal to be more pain than purity). Consequently, the systems programmer may be forced to large-scale use of assembly code.

With memory-mapped I/O, however, writing the interfaces is quite easy. Take, for example, this mechanism for tone generation on the OSI C8P.

Memory-mapped I/O refers to computers in which all the peripheral devices are assigned specific memory locations. The processor writes to and reads from these locations just like any other locations; only the peripheral devices know that they're there. Consequently, all primitive I/O can be done by the Basic POKE and PEEK statements.

Address correspondence to Marc Stiegler, 132 Laurel Way, Apt. 2B, Herndon, VA 22070.

Listing 1. POKE and PEEK procedures in Pascal.

```
;**************************
;* THIS SOURCE CONTAINS 2 SUBROUTINES:
;*
;* PROCEDURE POKEHI(LOCATION,VALUE:INTEGER)
;*     AND
;* FUNCTION PEEKHI(LOCATION:INTEGER):INTEGER
;*
;* THE VALUE PASSED TO POKEHI IS
;* ASSUMED TO BE IN RANGE 0..255,
;* AND PEEKHI RETURNS A VALUE
;* IN RANGE 0..255
;* IN BOTH SUBROUTINES, THE LOCATION
;* SHOULD BE IN RANGE 0..32767.  THE
;* SUBROUTINES ALWAYS ADD 32768 TO THE
;* LOCATION, SO THEY ACCESS THE TOP
;* HALF OF MEMORY.
;**************************
.PROC    POKEHI,2
;**STORE RETURN ADDRESS
PLA
STA      RETURN
PLA
STA      RETURN+1
;**GET SIGNIFICANT BYTE OF INTEGER
PLA
TAY
PLA      ;THROW SECOND HALF OF INTEGER AWAY
;**STORE MEMORY LOCATION FOR POKING ON ZERO PAGE
PLA
STA      51H
```

More →

The Programs

It is possible to write POKE and PEEK statements for Pascal; in fact, there are several methods for doing so. Listing 1 shows a variant on POKE and PEEK which can be written using the UCSD assembler. Since most of the interesting I/O locations are found in the top 32K of RAM, and since a normal integer in Pascal can only go up to 32767, the procedure POKEHI adds 32768 to the location passed to it (by flipping the left-most bit). Thus, to put a 1 in location 43879, you would invoke POKEHI(11111,1).

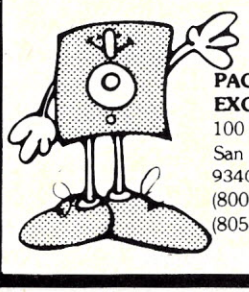
In a sense, POKEHI and PEEKHI solve all the problems with I/O, at least as well as they can be solved in Basic. However, Pascal can do better. The POKEHI statement is as dangerous as it is powerful—there are only a handful of locations you would ever really want to POKE to, but there are now almost 32K locations you can POKE by accident as well. Thus, you want to channel the use of poking to productive purposes. You do this by building a UCSD library package, called a UNIT. The UNIT SOUND is

Program continued.

```
        PLA
        CLC     ;ADD 2**15 SO RIGHT ADDRESS FOUND
        ADC     #80H
        STA     52H
        LDX     #0      ;GET 0 FOR ADDRESSING,PUT INTEGER IN
        TYA             ;REGISTER A
        STA     @51H,X  ;POKE THE INTEGER
        ;**GET BACK RETURN ADDRESS
        LDA     RETURN+1
        PHA
        LDA     RETURN
        PHA
        RTS
RETURN  .WORD
        ;*****************************
        .FUNC   PEEKHI,1
        ;**STORE RETURN ADDRESS
        PLA
        STA     RETURN
        PLA
        STA     RETURN+1
        ;**THROW OUT 2 DEAD WORDS
        ;**  (THESE DEAD BYTES ARE PASSED IN PASCAL
        ;**   FOR EVERY FUNCTION CALL)
        PLA
        PLA
        PLA
        PLA
        ;**STORE MEMORY LOCATION FOR PEEKING ON ZERO PAGE
        PLA
        STA     51H
        PLA
        CLC     ;ADD 2**15 SO RIGHT ADDRESS FOUND
        ADC     #80H
        STA     52H
        LDX     #0      ;GET 0 FOR ADDRESSING
        LDA     @51H,X  ;PEEK, GETTING VALUE IN REGISTER A
        TAY     ;PUSH 0 FOR MSB OF INTEGER IN RETURN
        LDA     #0
        PHA
        TYA     ;PUSH INTEGER
        PHA
        ;**GET BACK RETURN ADDRESS
        LDA     RETURN+1
        PHA
        LDA     RETURN
        PHA
        RTS
RETURN  .WORD
        .END
```

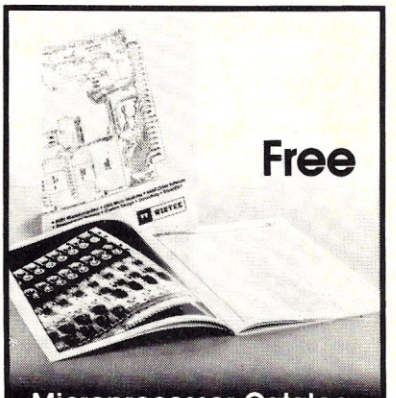

MEMOREX
FLEXIBLE DISCS

WE WILL NOT BE UNDERSOLD!! Call Free **(800)235-4137** for prices and information. Dealer inquiries invited and C.O.D.'s accepted.



VISA

PACIFIC EXCHANGES ✓172
100 Foothill Blvd.
San Luis Obispo, CA
93401. In Cal. call
(800)592-5935 or
(805)543-1037



Free

Microprocessor Catalog

40 page catalog of 6800 single board computers, interface modules, SPRINT 68 control computer/development system, WIZRD multitasking DOS, assemblers, compilers, BASIC, cross assemblers, cross compilers, custom engineering, OEM applications software.

WINTEK

Wintek Corp.
1801 South Street
Lafayette, IN 47904
317-742-8428 ✓163

ELCOMP
BOOKS and SOFTWARE

For ATARI – PET – OSI – APPLE II – 6502

ATARI BASIC – Learning by Using
This new book is an "Action"-Book. You do more than read it. Learn the intricacy of ATARI-BASIC thorugh the short programs which are provided. The suggestions challenge you to change and write program routines. Yes, it's exciting – Many of the programs are appropriate for beginners as well as experienced computer users. (Screen Drawings, Special Sounds, Keys, Paddles + Joysticks, Specialized Screen Routines, Graphics and Sound, Peeks and Pokes and special stuff).
Order-No. 164 $9.95

Games for the ATARI-Computer
How to program your own games on the ATARI. Complete listings in BASIC and Machine Language of exciting games. Tricks and hints.
Order-No. 162 $4.95

ATMONA-1
Machine Language Monitor for the ATARI 400/800.
This powerful monitor provides you with the firmware support that you need to get the most out of your powerful system. ATMONA-1 comes on a bootable cassette. No cartridges required. Disassemble, Memory Dump HEX + ASCII, (Change Memory Locations, Blocktransfer, fill memory block, save and load machine language programs, start mach. Lang. Progr. (Printer optional).
Comes with introductionary article on how to program the ATARI computer in machine language. (Available also in ROM)
Order-No. 7022 $19.95

ATMONA-2 Superstepper
A very powerful Tracer to explore the ATARI ROM/RAM area. Stop at previously selected address. Opcode or operand (cassette).
Order-No. 7049 $49.95

EDITOR/ASSEMBLER for ATARI 800, 32K RAM
Extremely fast and powerful Editor/Assembler. (8K Source code in about 5 seconds) Includes ATMONA-1.
Order-No. 7098 $49.95

MACRO-Assembler
for ATARI 800, 48K RAM
Please specify your system: RAM, disc or cassette.
Order-No. 7099 $89.00

Gunfight – For ATARI 400/800 16K RAM, needs two joysticks, animation and sound. (8K machine language).
Order-No. 7207 $19.95

EPROM BURNER for ATARI 400/800. Bare boards only with description, schematic + software (2716, 2732).
Order-No. 7041 $99.00

Invoice Writing for very small business with ATARI 400/800 16K RAM.
Order-No. 7022, cass. $29.85
Order-No. 7200, disc. $39.99

Wordprocessor for ATARI 800, 48K RAM
Order-No. 7210 $29.95

How to connect your EPSON-Printer to the ATARI 400/800. Construction article with printed circuit board and software. (Screenprint and variable characters per line).
Order-No. 7210 $19.95

OSI OSI OSI OSI OSI

The First Book of Ohio Scientific
Introduction to OSI computers. Diagrams, hardware and software information not previously available in one compact source. 192 pages.
Order-No. 157 $7.95

The Second Book of Ohio Scientific
Very valuable information about OSI microcomputer systems. Introduction to OS-65 D and OS-65U networking. Hardware and software hints and tips. Systems specifications. Business applications.
Order-No. 158 $7.95

The Third Book of Ohio Scientific is now available!
Very important information for the OSI system experimenter. Interface techniques, system expansions, accessories and much more (EPROM-Burner, 6522 I/O-card with 1K RAM, Soundboard, EPROM/RAM board).
Order-No. 159 $7.95

The Fourth Book of OHIO
VIP-Book – Very Important Programs. Many interesting programs for OSI computers, Sorting (Binary Tree). Differential Equitation, Statistics, Astrology, Gas Consumption, Games a. s. o.
Order-No. 160 $9.95

VIP Package – Above book plus a cassette with the programs.
Order-No. 160 A $19.95

The Fifth book of Ohio Scientific
Many exciting programs programming hints and tricks, Textwriter, Debugger for C1P, Games, Utilities and much more (polled keyboard)
Order-No. 161 $7.95

Invoice Writing Program for OSI-C1PMF, C4P. Disk and Cassette, 8K RAM.
Order-No. 8234 $29.80

Mailing List for C1PMF or C4PMF 24K RAM
250 addresses incl. phone number and parameters on one 5 1/4 disk)
Order-No. 8240 $29.80

8K Microsoft BASIC Reference Manual
Authoritative reference for the original Microsoft 4K + 8K BASIC developed for ALTAIR and later computers including OSI, PET, TRS-80 and VIC.
Order-No. 141 $9.95

Expansion Handbook for 6502 and 6802
S-44 Card Manual describes all of the 4.5 x 6.5 44 pin S-44 cards incl. schematics. A MUST for every 6502 system user (KIM, SYM, AIM, VIC, PET, OSI)
Order-No. 152 $9.95

Microcomputer Application Notes
Reprint of Intel's most important application notes including 2708, 8085, 8255, 6251 chips. Very necessary for the hardware buff.
Order-No. 153 $9.95

Complex Sound Generation
New revised applications manual for the Texas Instruments SN 76477 Complex Sound Generator.
Order-No. 154 $6.95

Small Business Programs
Complete listings for the business user. Inventory, Invoice Writing, Mailing List and much more. Introduction to Business Applications.
Order-No. 156 $14.90

Microcomputer Hardware Handbook
Descritions, pinouts and specifications of the most popular microprocessor and support chips. A MUST for the hardware buff.
Order-No. 29 $14.95

Care and Feeding of the Commodore PET
Eight chapters exploring PET hardware. Includes repair and interfacing information. Programming tricks and schematics.
Order-No. 150 $9.95

Prototype-Expansion Board for VIC-20 (S-44-Bus).
Order-No. 4844 $18.95

16K RAM/ROM board for S44-bus. Any combination of RAM and ROM on one board. (SY2128 or 2716)
Order-N0. 613 $39.95

Low cost expanison boards for your APPLE II. Bare board comes with extensive description and software.
Prototyping card
Order-No. 604 $29.00
6522 VIA–I/O Exp.
Order-No. 605 $39.00
2716 EPROM-Burner
Order-No. 607 $49,00
8K EPROM/RAM Card
Order-No. 609 $29.00

ELCOMP Publishing, Inc., 53 Redrock Lane
Pomona, CA 91766, Phone: (714) 623-8314

Payment: Check, Money Order, VISA, Mastercharge, Eurocheck. POSTPAID or PREPAID in USA. $5.00 handling fee for C.O.D. All orders outside USA: Add 15 % shipping. CA add 6.5 % sales tax. ATARI is a registered trademark of ATARI Inc.
APPLE II is a registered trademark of APPLE Inc.

ELCOMP ✓169
BOOKS and SOFTWARE

✓See List of Advertisers on page 130

displayed in Listing 2. A sample of how you would use the sound is shown in Listing 3. [Note that this program will compile correctly only if the UNIT SOUND and the POKEHI assembly code have been added to the system library; otherwise, the (*$U filename*) compiler command must be placed before the statement USES SOUND so the compiler knows where to look for the interface specifications.]

Finally, one marvelous side benefit of using UNITs is that, once the UNITs are written, you can forget about how to write them. Never again will you wind up digging through manuals trying to remember the memory locations you POKE or PEEK to for I/O.■

```
PROGRAM SIMPLE_MUSIC;
USES SOUND;
VAR NOTE:TONE;

PROCEDURE PAUSE;
VAR I,J:INTEGER;
BEGIN
FOR I:=1 TO 100 DO
   J:=1;
END;

BEGIN
SOUND_ON;
FOR NOTE:=1 TO 255 DO
   BEGIN
   MAKE_MUSIC(NOTE);
   PAUSE;
   END;
SOUND_OFF;
END.
```

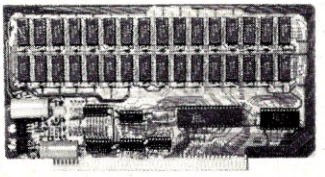
Listing 3. Using UNIT SOUND.

```
(*$S+*)  (*SWAP OPTION MUST BE ON TO COMPILE UNITS*)
(*$R-*)
UNIT SOUND;

INTERFACE
   TYPE TONE=1..255;

   PROCEDURE SOUND_ON;
   PROCEDURE SOUND_OFF;
   PROCEDURE MAKE_MUSIC(NOTE:TONE);

IMPLEMENTATION

CONST ON_OFF_PORT=24064;

PROCEDURE POKEHI(LOCATION,VALUE:INTEGER);
TYPE TWO_CASES=(INT,POINT);
     SMALL_INT=0..255;
     BOOL_ARRAY=PACKED ARRAY[0..1] OF SMALL_INT;
     ADDRESSES=RECORD
               CASE TWO_CASES OF
               INT:(VALUE:INTEGER);
               POINT:(POINTER:^BOOL_ARRAY);
               END;
VAR ADDRESS:ADDRESSES;
BEGIN
ADDRESS.VALUE:=LOCATION+32765+3;
ADDRESS.POINTER^[0]:=VALUE;
END;

PROCEDURE SOUND_ON;
(*THIS PROCEDURE ASSUMES THE MONITOR IS
  SET TO 64 CHARACTER LINES ON A B&W MONITOR*)
CONST ON=3;
BEGIN
POKEHI(ON_OFF_PORT,ON);
END;
PROCEDURE SOUND_OFF;
(*THIS PROCEDURE ASSUMES THE MONITOR IS
  SET TO 64 CHARACTER LINES ON A B&W MONITOR*)
CONST OFF=1;
BEGIN
POKEHI(ON_OFF_PORT,OFF);
END;
PROCEDURE MAKE_MUSIC;
CONST MUSIC_PORT=24321;
BEGIN
POKEHI(MUSIC_PORT,NOTE);
END;

END.
```

Listing 2. Channeling POKE statements with the UNIT SOUND.

Big sale on K's!

16K...$149.95
32K...$199.95
48K...$249.95
64K...$299.95



New JAWS-IB
The Ultrabyte Memory Board

Due to the tremendous success of our JAWS I, we were able to make a special purchase of first-quality components at below-cost prices for JAWS-IB. And we are sharing our cost saving with you. But don't be surprised if the next time you see this ad the prices have gone up substantially. Better yet, order now, and get the best memory on the market at the best price on the market.

ONE CHIP DOES IT ALL
Jaws-IB is the Rolls-Royce of all the S100 dynamic boards. Its heart is Intel's single chip 64K dynamic RAM controller. Eliminates high-current logic parts . . delay lines . . . massive heat sinks . . . unreliable trick circuits. JAWS-IB solves all these problems.

LOOK WHAT JAWS-IB OFFERS YOU
Hidden refresh . . . fast performance . . . low power consumption . . . latched data outputs . . . 200 NS 4116 RAM's . . . on-board crystal . . . RAM Jumper selectable on 8K boundaries . . . fully socketed . . . solder mask on both sides of board . . . phantom line . . . designed for 8080, 8085, and Z80 bus signals . . . works in Explorer, Sol, Horizon, as well as all other well-designed S100 computers.

10-DAY MONEY-BACK TRIAL: Try a fully wired and tested board for 10 days — then either keep it, return it for kit, or simply return it in working condition.

Continental U.S.A. Credit Card Buyers Outside Connecticut:
TO ORDER CALL TOLL FREE 800-243-7428
From Connecticut Or For Assistance:
(203) 354-9375 KB8

Please send the items checked below:

JAWS-IB kit:
☐ 16K..... $149.95*
☐ 32K..... $199.95*
☐ 48K..... $249.95*
☐ 64K..... $299.95*

JAWS-IB Fully Assembled, Wired & Tested:
☐ 16K..... $179.95*
☐ 32K..... $239.95*
☐ 48K..... $299.95*
☐ 64K..... $359.95*

☐ **EXPANSION KIT, 16K RAM Module, to expand JAWS-IB in 16K blocks up to 64K. $59.95**

**All prices plus $2 postage and insurance ($4.00 Canada). Connecticut residents add sales tax.*

Total enclosed: $ _____

☐ Personal Check ☐ Money Order or Cashier's Check
☐ VISA ☐ Master Card (Bank No.)

Acct. No. _____ Exp. Date _____

Signature _____

Print Name _____

Address _____

City _____

State _____ Zip _____

NETRONICS R&D Ltd.
333 Litchfield Road, New Milford, CT 06776

Riverbank Software Inc.

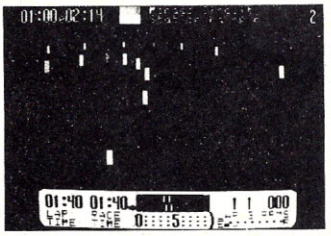
142

PROUDLY INTRODUCES

INTERNATIONAL GRAN PRIX

an arcade-like race car simulation
by RICHARD ORBAN
author of THREE MILE ISLAND*

REQUIRES APPLE II ★ ★ OR APPLE II PLUS ★ ★ 48K, 13 OR 16 SECTOR DISK, PADDLE CONTROL



$30.00 PER DISK
MD. RESIDENTS ADD 5%
U.S. CURRENCY ONLY

See your local dealer

VISA/MASTERCHARGE
MONEY ORDERS/COD
DEALER/DISTRIBUTOR
INQUIRIES INVITED

INQUIRIES AND ORDERS: 301-479-1312
SMITH'S LANDING ROAD
POST OFFICE BOX 128
DENTON, MD. 21629

● SPECIAL FEATURES ●

Five GRAND PRIX-style road circuits, including: Oulton Park, Warwick Farm, Karlskoga, and Monaco ● Five speed manual or automatic transmission (with or without cruise control) ● Eight levels of difficulty.

● ADDITIONAL FEATURES ●

Speeds to 198 MPH ● controlled skids ● spinouts ● spectacular crashes ● hair pin turns ● narrow corners ● obstacles ● identified circuit features ● number of laps selection ● flashing last lap indicator ● 'Christmas tree' controlled start ● switch for silent operation ● blue post marks 300' intervals ● best lap/best race times posted ● fully instrumented control panel: lap timer ● race timer ● indicator lights ● edge detectors ● position indicator ● steering indicator ● moving speed tape ● lap counter ● gear and RPM indicators ● operating fuel gauge

RIVERBANK WILL REPLACE DAMAGED DISKS WITHIN 1 YEAR OF PURCHASE. RETURN DISK WITH PROOF OF PURCHASE PLUS FIVE DOLLARS POSTAGE AND HANDLING FOR IMMEDIATE REPLACEMENT
(TEN DOLLARS OVERSEAS)

*TRADEMARK MUSE CO., BALT. MD. ★ ★ APPLE COMPUTER, INC., CUPERTINO, CA.

MED SYSTEMS SOFTWARE

Med Systems now offers some of the finest professional software available today. More complete information is available in our full page ads in *'80 Microcomputing*, or by calling our toll free number.

PROFESSIONAL/SCIENTIFIC WORD PROCESSING
Qwerty 3.0 offers more features than any Scripsit patch available today. Like Greek letters. Over 75 new symbols. Page end indication. Footnotes. Simultaneous superscripts and subscripts. User-controlled cursor speed. Two and three column formats. Qwerty 3.0 requires at least one disk, a TRS-80 Model I or Model III, and Scripsit. $74.95

STATISTICAL PACKAGE FOR MICROCOMPUTERS (SPM)
SPM, written by Bruce Powel Douglass, is one of the finest statistics packages available for the TRS-80. It includes descriptive statistics, one and two way analysis of variance, single and multiple variable linear regression, and single and multiple non-linear regression. Requires a TRS-80 Model I or III with disk. $89.95

WE GUARANTEE SATISFACTION!

When ordering, please indicate Model I or Model III, and number of disk drives in your system.

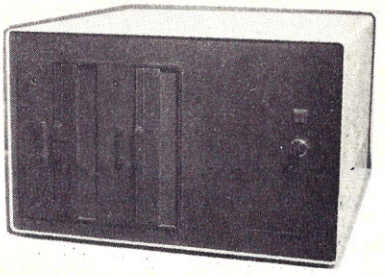
MED SYSTEMS Software 165
P.O. BOX 2674 CHAPEL HILL, NC 27514
1-800-334-5470

*STATES COMPUTERS !

237

60 N. 300 WEST PROVO UTAH 84601

CALL: (801) 377-2247



Industrial Computer System — $2695.00

A rugged Z80A system suited for tough applications. Uses *CP/M operating system, allowing use of thousands of CP/M compatable business, industrial and hobby software programs now available. This computer features:

- Z80A Processor!
- 2 Serial Ports!
- 2 8" Double Sided, Double Density Disks, 1 Meg each.!
- 8 Slot - S100 Buss!
- 64K Dynamic RAM!
  EPROM Burner on Board!
  (needs rom kit for operation).
- Just add terminal for working system!

QUME SHUGART ACCESSORY SPECIAL!
New disk drives in boxes.

8" Single Sided $465.00
8"Double Sided 575.00
Terminal Cables (RS232) . 24.95
2716 EPROMS 4.50
4164 Dyn RAMs 10.50
Misc. 8" Floppy Disks ..... (call)
4116 Dyn RAMs ..... (call)

ROM kit for industrial computer which allows programming of 2716 EPROMS, kit includes 1 personality ROM, 1 2K X 8 RAM, 1 2K Monitor - $60.00.

Control Computer Board Bonanza! Special on Z80A full slave S100 board. This is a complete, one board computer to do your slave programs allowing your master computer to run other programs. Slave interupts master only when something needs attention. Contains Z80A, 2K 2716 EPROM, 2K of static RAM, 25 buffered control lines. Use for control of toasters, coffee pots, sprinklers, stereos, N.C. Mills, nuclear power plants, printers, disk drives, tape drives, or just about anything! Comes programmed to run a SA1000 Hard Disk. Comes with spec. sheet and program examples - $230.00!!!

Fast Dot Matrix Printers

175 CPS with factory warranty. 135 column for wide computer paper. These are full sized printers suited for heavy use, not "Hobby" printers!!! Bi-directional operation. Form tractor feed. Condensed print. RS232 hook-up with options - $995.00!!!

*CP/M Trademark of Digital Research

*A DIVISION OF GOLDEN WEST COMPUTERS INC.

See List of Advertisers on page 130

It's no hocus-pocus. Even in Basic, the Sorcerer can display reverse video with the help of a machine-language subroutine.

Reverse Video For the Sorcerer

By Dwayne E. Smith

I'm sure that some of you Sorcerer users (and some of you with memory-mapped video boards) would like to be able to print reverse video on screen. For the Sorcerer, it's easy. All it takes is a short machine-language subroutine that can be used from Basic or other languages that can call a machine-language program.

After reading Charles Strom's article about using WordStar with the Sorcerer computer (April 1981, pp.180–182), in which he mentions that he produced reverse video, I decided that I wanted to use reverse video for VEDIT. The VEDIT text editor can use reverse video for the status line and the cursor. For more about VEDIT, see Gene Head's review (May 1981, pp. 50–51). Before we look at the subroutine, let's see how the Sorcerer's video works.

Sorcerer Video

With memory-mapped video, each location for each character on the screen is addressed as memory. Video boards of this type commonly display 64 characters and 16 lines of text, which is very convenient since this uses 1K bytes of memory. The Sorcerer, on the other hand, displays 64 characters and 30 lines of text (1920 bytes).

To print a character, the ASCII (American Standard Code of Information Interchange) value of the character needed must be placed into the appropriate byte of memory. Say, for example, that you want to place the character A at the four corners of the screen. The Sorcerer's screen RAM begins at F080H, which is the

```
EXIDY Z-80 ASSEMBLER
   ADDR  OBJECT    ST #

                   0001
                   0002 ;        REVERSE VIDEO SUBROUTINE
                   0003 ;                FOR THE
                   0004 ;       E X I D Y   S O R C E R E R
                   0005
                   0006
                   0007
                   0008         ;EQUATES
                   0009
   >F800           0010 CHARST  EQU     0F800H  ;LOC. OF ASCII
   >FC00           0011 CHARPT  EQU     0FC00H  ;LOC. OF GRAPHICS
   >0400           0012 COUNT   EQU     CHARPT-CHARST   ;NO. OF
                   0013                         ;CHARS. TO MOVE
                   0014
                   0015
                   0016 ;COPY THE ASCII CHARS. INTO GRAPHICS AREA
                   0017
  '0000  2100F8    0018 REVID   LD      HL,CHARST       ;LOAD POINTERS
  '0003  1100FC    0019         LD      DE,CHARPT
  '0006  010004    0020         LD      BC,COUNT        ;LOAD LOOP
                   0021                                 ;COUNTER
  '0009  EDB0      0022         LDIR            ;COPY ASCII INTO
                   0023                         ;GRAPHICS AREA
                   0024
                   0025
                   0026 ;COMPLEMENT EACH BYTE IN THE GRAPHICS AREA
                   0027
  '000B  2100FC    0028         LD      HL,CHARPT       ;LOAD POINTER
  '000E  010004    0029         LD      BC,COUNT        ;LOAD LOOP
                   0030                                 ;COUNTER
  '0011  7E        0031 LOOP    LD      A,(HL)  ;GET A CHAR.
  '0012  2F        0032         CPL             ;REVERSE BITS
  '0013  77        0033         LD      (HL),A  ;PUT IT BACK
  '0014  23        0034         INC     HL      ;ADVANCE POINTER
  '0015  0B        0035         DEC     BC      ;COUNT ONE CHAR DONE
  '0016  97        0036         SUB     A       ;CLEAR A REG.
  '0017  B0        0037         OR      B       ;IS B REG. ZERO?
  '0018  20F7      0038         JR      NZ,LOOP-$       ;NO, DO AGAIN
  '001A  97        0039         SUB     A       ;YES, CLEAR A REG.
  '001B  B1        0040         OR      C       ;IS C REG. ZERO?
  '001C  20F3      0041         JR      NZ,LOOP-$       ;NO, DO AGAIN
  '001E  C9        0042         RET             ;YES, WE'RE DONE!!
                   0043
                   0044 ;END
ERRORS=0000

CHARPT      FC00 CHARST      F800 COUNT       0400
LOOP        0011 REVID       0000
```

Listing 1.

Address correspondence to Dwayne E. Smith, 2949 Ulloa St., San Francisco, CA 94116.

upper left corner. The top-right corner is at F0BFH, the bottom-left at F7C0H, and the bottom-right corner (which is the end of screen RAM) is F7FFH. The ASCII number for A is 41H. If 41H is placed into the four previously-mentioned addresses, you'll see an A in each of the corners of your screen.

If you work only in Basic, you'll need to use the twos-complement form of the addresses since you can't poke anywhere above 32767 (7FFFH). For you, the corners of the screen are −3968 and −3905 for the top left and right, and −2112 and −2049 for the bottom left and right.

Each character (alphanumeric, graphic or user-defined) is printed on the screen as an 8×8 array of pixels (dots). Each pixel can be on (lit) or off (dark). The shape of the characters depends on which of these dots are on and off.

Each row of data is stored in a byte of memory. A 0 bit means that its pixel is off; a 1 means that it's on. It takes eight bytes to construct a character. If, for example, you want a solid block character, all of the bits must be on in memory (FFH or 255 decimal) at that character's location (see Fig. 1).

The Sorcerer can address 256 characters. The 128 standard ASCII character set is stored in a PROM at addresses F800H to FBFFH. That leaves another 128 characters. The 64 graphics symbols, pictured above the letters on the keyboard, are written into RAM addresses FC00H to FDFFH. The other 64 characters are the user-programmable set located at addresses FE00H to FFFFH. Since the set of graphics symbols is stored in RAM, the whole graphics area from FC00H to FFFFH is programmable.

		HEX	DECIMAL
FE00	X X X X X X X X	FF	255
FE01	X X X X X X X X	FF	255
FE02	X X X X X X X X	FF	255
FE03	X X X X X X X X	FF	255
FE04	X X X X X X X X	FF	255
FE05	X X X X X X X X	FF	255
FE06	X X X X X X X X	FF	255
FE07	X X X X X X X X	FF	255

SOLID SQUARE

Fig. 1.

Listing 2.

```
;*********************************************************
;*                                                       *
;*                                                       *
;*              REVERSE VIDEO SUBROUTINE                 *
;*                      for the                          *
;*            E X I D Y   S O R C E R E R                *
;*                                                       *
;*                                                       *
;*********************************************************


;*********************************************************
;*                                                       *
;**********************   NOTES   ************************
;*                                                       *
;*                                                       *
;*    The 128 standard ASCII characters located in PROM  *
;*    (F800H - FBFFH) are copied into the programmable   *
;*    graphics area (FC00H - FFFFH). Each bit in the     *
;*    graphics area is then complemented, so that bits   *
;*    normally on are off, and vice versa. Please note   *
;*    that the form feed character (control - L) will    *
;*    rewrite the Sorcerer's standard graphics into lo-  *
;*    cations FC00H - FDFFH.                             *
;*                                                       *
;*********************************************************


;*********************************************************
;*                                                       *
;*************   Z-80  INSTRUCTION EQUATES   *************
;*                                                       *
;*                +------------------------+             *
B0ED =          LDIR:   EQU     0B0EDH  ;Z-80 LDIR instruction (EDB0H)  *
;*                                        ; in reverse notation          *
;*                                                       *
0020 =          JRNZ:   EQU     20H     ;Z-80 JRNZ instruction          *
;*                                                       *
;*********************************************************
;*                                                       *
;*************   LOCATION AND COUNT EQUATES   ************
;*                                                       *
;*                +------------------------+             *
F800 =          CHARST: EQU     0F800H  ;Location of alphanumeric       *
;*                                        ; charcter area                *
;*                                                       *
```

More →

Reverse Video

A common way of producing reverse video is to use bit 7 (the most significant bit) of the character set to determine whether it is normal or reverse. For example, a space character is black in normal video. Its ASCII number is 20H. The reverse video space character is an all-white block. Its ASCII number is A0H (A0H = 10100000 binary = 20H [00100000B] + 80H [10000000B]). As you can see, when the most significant bit is on, the reverse video space character is addressed.

To do the same with the Sorcerer, you must first move the ASCII character set into the graphics memory area. You can then complement each byte. This means that the status of each bit is switched. All of the bits that are on are turned off, and vice versa. In this way you create the reverse image of the characters (light becomes dark, and dark become light).

I have included two listings of the assembly-language subroutine (Listings 1 and 2). Listing 1 was assembled with the Sorcerer Development Pac in Z-80 assembly language. Listing 2 was done with the CP/M assembler ASM. The subroutine is short enough that those of you without an assembler can enter the machine code without trouble. Those of you with CP/M may wish to store Listing 2 on disk so that you have the source code handy.

If you are familiar with 8080 assembly language, you may have noticed the relative jump instructions, which are not included in the 8080 instruction set. Since the Sorcerer uses a Z-80 microprocessor, these instructions may be used, and are

Listing 2 continued.

```
FC00 =          CHARPT: EQU     0FC00H  ;Location of graphics          *
                *                       ; character area               *
                *                                                      *
0400 =          COUNT:  EQU     CHARPT - CHARST ;Number of characters  *
                *                               ; to move              *
                *                                                      *
                ********************************************************

                ********************************************************
                *                                                      *
                *  Now we move the standard ASCII characters into the  *
                *  graphics memory area.                               *
                *                                                      *
                *                    +---------------+                 *
                *                                                      *
0100                    ORG     100H            ;This subroutine may be *
                *                               ; be placed anywhere in *
                *                               ; the TPA.             *
                *                                                      *
                *                                                      *
0100 2100F8     REVIDEO:LXI     H,CHARST        ;Load pointer to the    *
                *                               ; character location.  *
                *                                                      *
0103 1100FC             LXI     D,CHARPT        ;Load pointer to the    *
                *                               ; graphics location.   *
                *                                                      *
0106 010004             LXI     B,COUNT         ;Loop counter stores    *
                *                               ; the number of char-  *
                *                               ; acters to be moved.  *
                *                                                      *
0109 EDB0               DW      LDIR            ;Copy ASCII characters  *
                *                               ; in the graphics loc. *
                *                                                      *
                ********************************************************


                ********************************************************
                *                                                      *
                * Now that we have the ASCII where we want them, we    *
                * reverse the bits in each character, thereby producing *
                *                     REVERSE VIDEO!!                  *
                *                                                      *
                *                  +---------------------+             *
                *                                                      *
010B 2100FC             LXI     H,CHARPT        ;Load the pointer to    *
                *                               ; the graphics loca-   *
                *                               ; tion.                *
                *                                                      *
010E 010004             LXI     B,COUNT         ;Loop counter stores    *
                *                               ; the number of char-  *
                *                               ; acters.              *
                *                                                      *
0111 =          LOOP:   EQU     $               ;                       *
0111 7E                 MOV     A,M             ;Get a character,       *
0112 2F                 CMA                     ;reverse its bits,      *
0113 77                 MOV     M,A             ;and put it back.       *
0114 23                 INX     H               ;Point to next char.,   *
0115 0B                 DCX     B               ;count one char. done.  *
0116 97                 SUB     A               ;Clear A register.      *
0117 B0                 ORA     B               ;Is B reg. zero?        *
0118 20F7               DB      JRNZ,LOOP-$+0FFH    ;No - keep looping. *
011A 97                 SUB     A               ;Clear A register.      *
011B B1                 ORA     C               ;Is C reg. zero?        *
011C 20F3               DB      JRNZ,LOOP-$+0FFH    ;No - keep looping. *
011E C9                 RET                     ;Yes, we're done!!      *
                *                                                      *
                ********************************************************

011F                    END
```

Listing 3.

```
 10 REM
 20 REM
 30 REM          SORCERER REVERSE VIDEO PRINTING
 40 REM               DEMONSTRATION PROGRAM
 50 REM
 60 REM                 by Dwayne E. Smith
 70 REM
 80 REM
 90 REM     This program may be used to see the use of the
100 REM    reverse video machine language subroutine in
110 REM    Exidy's Standard BASIC. The machine language sub-
120 REM    routine is POKE'd into memory by this program,
130 REM    and is called using the USR(X) command.
140 REM
150 REM ================================================
160 REM
170 PRINT CHR$(12):REM  CLEAR THE SCREEN BEFORE CALLING RE-
```

More

produced by using the DB (define a byte) directive. In an equate statement, I set JRNZ (jump relative if nonzero) equal to 20H. This is the Z-80 code for this instruction. To get the displacement, I used a formula found in Vista's "Tech. Notes" section of the V200 disk system manual. To jump forward, use "address-$-1"; to jump backwards, use "address-$+0FFH". *This method will not give an error message if the jump is too far for the computation,* but it is useful in many instances.

Demonstration

I have included two demonstration programs. The first (Listing 3) uses the Sorcerer's Standard Basic; the second (Listing 4) is in CBasic-2. Both of these programs take input from the keyboard, and print it in both normal and reverse video. Both of these programs load the machine-language subroutine into memory, but in very different ways.

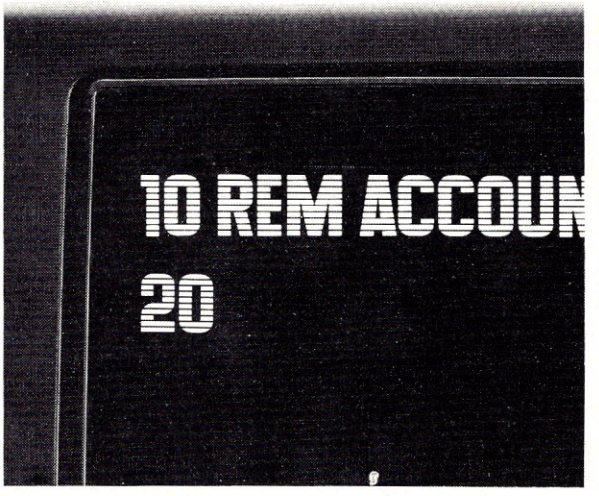
The Standard Basic program stores the subroutine in the form of data statements. The program is poked into memory, where it can be called using the USR(X) function. The location of the subroutine must be poked into a jump instruction. That's why we poke 0 into addresses 260 (low part of address) and 261 (high part of address). This will cause Basic to jump to the machine-language subroutine at 0000H. For more information about the USR(X) function, see the *Sorcerer Software Manual,* or the *Sorcerer Technical Manual* (#DP5003).

CBasic2 can load the subroutine directly from the disk. I have named the subroutine REVIDEO.COM, but the name can be different as long as the name in the disk directory and the program are the same. The SAVEMEM X,NAME instruction saves X bytes of memory for a machine-language program called Name, and then loads Name into memory. I have found that a variable cannot be used for X. An integer in either decimal or hexadecimal notation must be used.

To find the beginning address of Name, use the address in bytes 6 and 7 (which will be in the usual reverse notation), minus the value used as X. For example, in my 48K system, these bytes contain the address AA06H. Since the program in Listing 4 saves 80H bytes, the address of the subroutine REVIDEO.COM is AA06H – 80H = A986H.

Let me warn you—*don't* use DDT

BOY, IS THIS COSTING YOU.



It's really quite basic: time is money.

And BASIC takes a lot more time and costs a lot more money than it should every time you write a new business software package.

Especially when you could speed things up with dBASE II.

dBASE II is a complete applications development package.

Users tell us they've cut the amount of code they write by up to 80% with dBASE II.

Because dBASE II is the high performance relational database management system for micros.

Database and file handling operations are done automatically, so you don't get involved with sets, lists, pointers, or even opening and closing of files.

Instead, you write your code in concepts.

And solve your customers' problems faster and for a lot less than with BASIC (or FORTRAN, COBOL or PL/I).

dBASE II uses English-like commands.

dBASE II uses a structured language to put you in full control of your data handling operations.

It has screen handling facilities for setting up input and output forms.

It has a built-in query facility, including multi-key and sub-field searches, so you can DISPLAY some or all of the data for any conditions you want to apply.

You can UPDATE, MODIFY and REPLACE entire databases or individual characters.

CREATE new databases in minutes, or JOIN databases that already exist.

APPEND new data almost instantly, whether the file has 10 records or tens of thousands.

SORT the data on as many keys as you want. Or INDEX it instead, then FIND whatever you're looking for in seconds, even using floppies.

Organize months worth of data in minutes with the built-in REPORT. Or control every row and column on your CRT and your printer, to format input and output exactly the way you want it.

You can do automatic calculations on fields, records and entire databases with a few keystrokes, with accuracy to 10 places.

Change your data or your entire database structure without re-entering all your data.

And after you're finished, you can protect all that elegant code with our run-time compiler.

Expand your clientbase with dBASE II.

With dBASE II, you'll write programs a lot faster and a lot more efficiently. You'll be able to write more programs for more clients. Even take on the smaller jobs that were out of the economic question before. Those nice little foot-in-the-database assignments that grow into bigger and better bottom lines.

Your competitors know of this offer.

The price of dBASE II is $700 but you can try it free for 30 days.

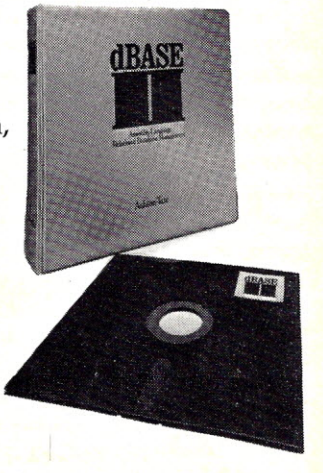
Call for our Dealer Plan and OEM run-time package prices, then take us up on our money-back guarantee. Send us your check and we'll send you a copy of dBASE II that you can exercise on your CP/M system any way you want for 30 days.

Then send dBASE II back and we'll return all of your money, no questions asked.

During that 30 days, you can find out exactly how much dBASE II can save you, and how much more it lets you do.

But it's only fair to warn you: business programmers don't go back to BASIC's.

Ashton-Tate, 9929 Jefferson, Los Angeles, CA 90230. (213) 204-5570.



Ashton-Tate

©Ashton-Tate 1981

287

See List of Advertisers on page 130

(Dynamic Debugging Tool) to dump the memory for the address in bytes 6 and 7. DDT changes these values. The way that I found these values was to bring up the CP/M, reset, then dump the memory using the Monitor's DU command. This was done using a Vista V200 E-20 disk system. The technique may or may not work with other disk systems.

To print a string in reverse video, both programs follow the same procedure. The MID$ function is used to pick out each character in the string from left to right. The chosen character is changed into its ASCII number by the ASC function. The most significant bit (bit 7) is turned on by adding 80H or 128 decimal to the number (or by using the logical OR). The CHR$ function then converts this new number into its character equivalent.

Special Considerations

Some of you who try these programs may notice that the reverse characters don't look very good, or may even be illegible. I have found that the settings of your video monitor are very important. My monitor is an Amdek Video 100G, which has a signal control in the rear. This control can be varied to compensate for the strength of the input signal. If this control is set too high, the lit dots can bleed over into the dark spaces, causing characters such as (,), <, >, !, and # to almost disappear. Other monitors may have similar controls.

CP/M users may wish to place the reverse video routine in their CBIOS (customized basic input/output system). Because I wished to use reverse video with VEDIT, I had to include this routine as part of the disk operating system. I found that this routine (after omitting the RET instruction at the end) could be placed in the initialization routine.

Note that pressing the clear button or executing the clear-screen command PRINT CHR$(12) will rewrite the Sorcerer graphics into memory. The user-defined graphics will be untouched. This means that only a portion of the reverse video characters will be lost, but to rewrite them the subroutine must be executed once again.

The reason for the character loss is simple. The video screen is initialized by the Sorcerer's Monitor program every time the clear button is pressed, a reset is performed or a PRINT CHR$(12) command is given.

Listing 3 continued.

```
180 REM                    VERSE VIDEO SUBROUTINE.
190 FOR Q=0 TO 30
200 READ W
210 POKE Q,W:REM  POKE SUBROUTINE INTO BEGINNING OF MEMORY
220 NEXT Q
230 REM
240 REM        REVERSE VIDEO MACHINE LANGUAGE PROGRAM
250 REM
260 DATA 33,0,248,17,0,252,1,0
270 DATA 4,237,176,33,0,252,1,0
280 DATA 4,126,47,119,35,11,151,176
290 DATA 32,247,151,177,32,243,201
300 REM
310 POKE 260,0:POKE 261,0:REM  LOCATION OF SUBROUTINE IS
320 REM                        0000 HEX
330 Z=USR(Z):REM  EXECUTE THE SUBROUTINE
340 PRINT"Enter some characters and hit the RETURN key. To"
350 PRINT"quit, type the ESC key, then the RETURN key."
360 PRINT:PRINT
370 INPUT A$
380 IF A$=CHR$(27) THEN END:REM  QUIT IF ESC KEY IS TYPED.
390 GOSUB 480
400 PRINT A$,X$
410 PRINT
420 GOTO 370
430 REM
440 REM ************************************************************
450 REM          REVERSE VIDEO PRINTING SUBROUTINE
460 REM ************************************************************
470 REM
480 X$=""
490 FOR Q=1 TO LEN(A$)
500 X$=X$+CHR$(ASC(MID$(A$,Q,1))+128):REM  SET BIT 7 (MOST
510 REM                      SIGNIFICANT BIT) OF EACH CHARACTER
520 REM                      IN THE STRING.
530 NEXT Q
540 RETURN
READY
```

Listing 4.

```
REM  ************************************************************
REM
REM              SORCERER REVERSE VIDEO PRINTING
REM                    DEMONSTRATION PROGRAM
REM
REM                      by Dwayne E. Smith
REM
REM
REM       This is a simple program that may be used to see the
REM     use of the reverse video subroutine in CBASIC-2. The
REM     function FN.REVERSE.VIDEO$ is passed the string which
REM     is to be displayed in reverse video. The function need
REM     only appear in a PRINT statement for the string to be
REM     printed in reverse video.
REM
REM  ************************************************************

    REM    Set the constants

        PROG.LOC%        = 0A986H        REM  Location of program \
                                             REVIDEO.COM in a 48K \
                                             system (AA06H - 80H).

        PROG.NAME$       = "REVIDEO.COM"

        CLEAR.SCREEN$    = CHR$(12)      REM  Char. to clear screen
        ESCAPE$          = CHR$(27)      REM  ESC key

        NULL$            = ""

    REM    Clear the screen before calling the reverse video \
               subroutine.

        PRINT CLEAR.SCREEN$

    REM    Define the Reverse Video Printing Function

        DEF FN.REVERSE.VIDEO$(Z$)
```

More

Listing 4 continued.

```
            X$ = NULL$
            FOR Q% = 1 TO LEN(Z$)
                X$ = X$ + CHR$(ASC(MID$(Z$,Q%,1)) OR 80H)   REM \
                        Take each character in Z$ , and set bit 7 \
                        (the most significant bit). This will change \
                        the character into the reverse video of \
                        the original character.
            NEXT Q%
            FN.REVERSE.VIDEO$ = X$
            RETURN
        FEND

    REM     Load the reverse video machine language subroutine.

        SAVEMEM 80H, PROG.NAME$             REM  Save 128 bytes for \
                                                 subroutine, and load \
                                                 it into memory.


    REM     Execute the subroutine

        CALL     PROG.LOC%



    REM     Get the string input, and print in normal & reverse video

        PRINT "Enter some characters and hit the RETURN key. To"
        PRINT "quit, type the ESC key, then the RETURN key."
        PRINT : PRINT

10      INPUT STRING$
        IF STRING$ = ESCAPE$ THEN STOP
        PRINT STRING$, FN.REVERSE.VIDEO$(STRING$)
        PRINT
        GOTO 10
```

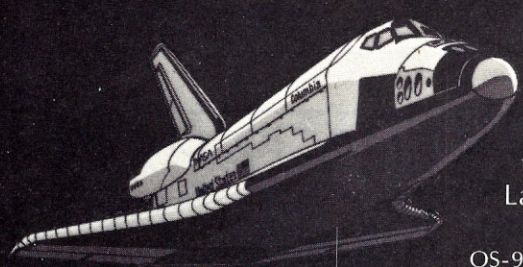
The initialization routine includes writing the Sorcerer graphics symbols into the locations FC00H to FDFFH. Since some of the characters occupy these locations, they are lost by this process.

This problem can be dealt with by simply re-executing the subroutines, which can be kept in memory. If used with CP/M, a control-C should rewrite the reverse video characters. If used in Basic (as in Listings 3 and 4), the clearing of the screen and the execution of the machine-language subroutine can be included in a subroutine of its own.

Conclusion

These ideas may also interest people who own memory-mapped video boards. The board must have enough programmable characters to hold the reverse character set. If your video board operates like the Sorcerer's video, the programs can probably be altered to work with your system. Other boards may require totally different methods. But I hope I've shown that reverse video with Exidy's Sorcerer is not only possible, but can be put to practical use.■

What's Good for the Space Shuttle is good for your Apple II! . . .



MICROWARE® creator of OS-9/BASIC Ø9 (used by N.A.S.A., and leading Universities, government agencies, and corporations Worldwide) joins with STELLATION TWO to deliver the same Operating system and Programming Language to the APPLE II.

OS-9/BASIC Ø9 are the result of a 3 year research project-designed with the 6809 in mind. This "Operators dream machine" combines with THE MILL microprocessor board to provide Apple II users with software features previously reserved for Mainframes and mini's.

JUST PLUG IN THE MILL AND LET BASIC Ø9 WORK FOR YOU! *other Stellation Two products include:*

Spooler: *Allows Apple II to print while processing*
Pascal Speedup: *THE MILL with software for a 50% faster Apple with Pascal*
Floating Point: *Extends the MILL's power to floating point numbers.)*

STELLATION TWO ↙179
The Lobero Building P.O. Box 2342
Santa Barbara, Ca, 93120
(805) 966-1140 TELEX 658439

MICROWARE®

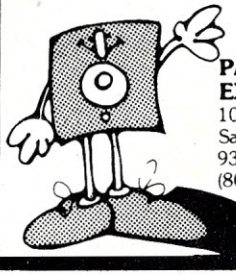
OS-9 is a trademark of Microware. BASICØ9 is a trademark of Microware and Motorola.

Apple II is a trademark of Apple computers.

↙See List of Advertisers on page 130

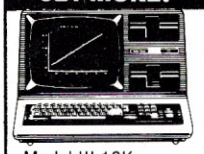
Dysan CORPORATION

Solve your disc problems, buy 100% surface tested Dysan diskettes. All orders shipped from stock, within 24 hours. Call toll FREE (800) 235-4137 for prices and information. Visa and Master Card accepted.



PACIFIC ✓172
EXCHANGES
100 Foothill Blvd.
San Luis Obispo, CA
93401. (In Cal. call
(805) 543-1037.)

YOU CAN PAY MORE BUT YOU CAN'T GET MORE!



Model III 16K
$839
Model III 48K
2 disc & RS232C
$2059

Color Computer 4K
$310
w/16K Ext. Basic
$459
w/32K Ext. Basic
$525

BUY DIRECT. These are just a few of our great offers which include Printers, Modems, Computers, Peripherals, Disc Drives, Software and more. call TOLL FREE 1-800-343-8124

We have the lowest possible fully warranteed prices and a full complement of Radio Shack Software.

computer plus
Write for your free catalog. ✓362
245A Great Road
Littleton, MA 01460
617 • 486 • 3193

master charge VISA

BACK ISSUES

KM3006—Single back issue before July 1980. . . . . $3.00
KM3507—Single back issue July 1980 on. $3.50
KM0005—5 your choice. . . . $10.75
Add $1.00 per magazine for shipping.

KM0010-10 your choice. . . . $16.00
KM0025-25 your choice. . . . $27.00
KM1025-25 our choice. $14.00
Add $7.50 per order for shipping.

●FREE BACK ISSUE CATALOGS are yours for the asking. . . specify *73 Magazine*, and/or *Microcomputing*, back issue catalog when you send your name and address to us on a postcard.

Back Issues ● Attn. Pauline Johnstone
80 Pine St. ● Peterborough, NH 03458

VOLTAGE SURGE & TRANSIENT SUPPRESSOR

Protects Most Electronic Equipment

The SUPPRESSOR electronically removes or reduces sudden voltage changes. It simply plugs into a power receptacle on the same circuit as the equipment being protected.

END POWER LINE SPIKES, SURGES, HASH... Only $29.95 ea. Dealer Inquiries Invited.

CUESTA SYSTEMS, INC.
3440 Roberto Court
San Luis Obispo, California 93401
(805) 541-4160
✓252

Votrax® SC-01A SPEECH SYNTHESIZER

Votrax® $70 Each (5 or more, $55 each)

Order in Ones or Thousands

The SC-01A Speech Synthesizer is a completely self-contained solid state device. This single chip phonetically synthesizes continuous speech of unlimited vocabulary.

The SC-01A contains 64 different phonemes which are accessed by a 6-bit code. Computer interfaces and text-to-speech algorithms also available for product development.

Votrax is a trademark of Federal Screw Works

Call 1-800-645-3479, in N.Y. 1-516-374-6793

MICROMINT INC.
917 Midway
Woodmere, N.Y. 11598

Call for quantity pricing.

MICRO MINT
✓347

ATTENTION !!

Foreign Computer Stores/ Magazine Dealers

You have a large technical audience that speaks English and is in need of the kind of microcomputer information the Wayne Green Publications group provides.

Provide your audience with the magazines they need and make money at the same time. For details on selling Microcomputing, 80 Microcomputing, Desktop Computing and Wayne Green Books contact:

Sandra Joseph
World Wide Media
386 Park Ave. South
New York, N.Y. 10016
Phone—(212) 686-1520
Telex—620430

fullFORTH+ for APPLE/PET

Full implementation of FIG FORTH PLUS

6502 CONDITIONAL ASSEMBLER
INTEGER AND FLOATING POINT ARITHMETIC
STRING MANIPULATION WORDS
IF-DO (A form of CASE statement)
CURSOR CONTROL SCREEN EDITOR
SINGLE AND MULTI-DIMENSIONAL ARRAYS
DISK VIRTUAL MEMORY
ADDITIONAL UTILITIES INCLUDING:
SCREEN TO SCREEN COPY
CORE DUMP
PRINTER CONTROL WORDS
FORTH WORD DECOMPILER
TARGET COMPILER NOW AVAILABLE
COMPLETE DOCUMENTATION INCLUDES:
INSTALLATION GUIDE (8 PAGES)
GETTING STARTED (TUTORIAL) (28 PAGES)
USERS GUIDE (86 PAGES)

Purchasers receive 1 year subscription to the fullFORTH+ Newsletter (Published bi-monthly)

Price $75.00 — foreign $85.00 (Add $2.50 shipping) (PA residents add 6% sales tax)

IDPC CO. — Box 11594, Phila., Pa. 19116
✓279 or call — (215) 676-3235

BUY DIRECT SAVE

TRS-80™ DISCOUNT DIRECT PRICES

WRITE FOR FREE CATALOG

TM - TANDY CORPORATION
FREE COPY OF WARRANTY UPON REQUEST

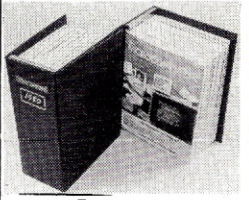
1-800-841-0860 Toll Free

YOUR TRS-80 PERSONAL COMPUTER Headquarters

Learn To "Do It Yourself" And Save Money

MICRO MANAGEMENT SYSTEMS, INC. ✓100
DEPT. NO. 7
Downtown Plaza Shopping Center
115C Second Ave. S.W. • Cairo, Georgia 31728
912-377-7120 Ga. Phone No.

MICROCOMPUTING



BINDERS & FILE CASES

order yours today

Organize and protect your valuable issues of MICROCOMPUTING with these handsome dark blue magazine binders or file cases. Each holds 1 full year of MICROCOMPUTING and has the magazine logo stamped in gold. An all metal mechanism in the binders allows easy consultation of any issue without removal. Please state years 1977 through 1983.

Binders—$7.50	3 for $21.75	6 for $42.00
File Cases—$5.95 ea.	3 for $17.00	6 for $30.00

Send check or money order only to:
MICROCOMPUTING BINDERS
P.O. Box 5120, Phila., PA 19141

Allow 6-8 weeks for delivery. Please no C.O.D. orders, no phone orders.

$15 MILLION!

THAT'S HOW MUCH OUR READERS SPEND ON HARDWARE AND SOFTWARE EVERY MONTH!!! MORE THAN TWO THIRDS OF THEM EXERT A MAJOR INFLUENCE ON THE PURCHASE OF COMPANY COMPUTERS. AND NEITHER OF THOSE FIGURES INCLUDE OUR MORE THAN 75,000 PASS-ALONG READERS, WHICH PUTS OUR TOTAL READERSHIP AT WELL OVER

170,000 BUYERS

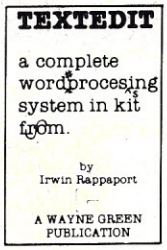
MOST OF WHOM ARE BETWEEN THE AGES OF 35 AND 45–MOST OF WHOM EARN BETWEEN $25,000 AND $40,000 A YEAR–AND MOST OF WHOM GET THE INFORMATION THEY NEED TO MAKE COMPUTER PURCHASING DECISIONS FROM COMPUTER MAGAZINES! AND DON'T FORGET THAT MANY OF THESE BUYERS ARE PART OF A TWO-INCOME FAMILY. SO IN AN ERA WHEN EVERY SALE HELPS, REMEMBER . . .

IT PAYS TO ADVERTISE IN MICROCOMPUTING

Call 1-603-924-7138 for more information.

WAYNE GREEN BOOKS

NEW



TEXTEDIT
A Complete Word Processing System in Kit Form
by Irwin Rappaport

TEXTEDIT is an inexpensive word processor that you can adapt to suit your needs, from writing form letters to large texts. It is written in modules, so you can load and use only those portions that you need. Included are modules that perform:

—right justification
—ASCII upper/lowercase conversion
—one-key phrase entering
—complete editorial functions and much more!

TEXTEDIT is written in TRS-80* Disk BASIC, and the modules are documented in the author's admirably clear tutorial writing style. Not only does Irwin Rappaport explain how to use **TEXTEDIT**; he also explains programming techniques implemented in the system.

TEXTEDIT is an inexpensive word processor that helps you learn about BASIC programming. It is written for TRS-80 Models I and III with TRSDOS 2.2/2.3 and 32K.

BK7387 $9.97 **Disk Available order DS7387 $19.97**

*TRS-80 and TRSDOS are trademarks of the Radio Shack Division of Tandy Corporation.

FOR TOLL-FREE ORDERING CALL 1-800-258-5473
WAYNE GREEN BOOKS • Peterborough, NH 03458

Use the order card in this magazine or itemize your order on a separate piece of paper and mail to: *Microcomputing* Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.50 handling first book, $1.00 each additional book, $10.00 per book foreign airmail. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at the above address.

Attention: European Subscribers

Due to shipping problems in Europe, we are asking our subscribers to send us their most recent mailing label from *Microcomputing*. If you are unable to provide us with a label, please send us your name and address, and tell us at what point you are presently in in your subscription. This information is very necessary in order to solve a forwarding problem, so we are asking for your co-operation in this matter.

Please direct all information to: Attn: Doris Day, *Microcomputing*, 80 Pine Street, Peterborough, NH 03458.

MOVING?

Let us know 8 weeks in advance so that you won't miss a single issue of Microcomputing.

Attach old label where indicated and print new address in space provided. Also include your mailing label whenever you write concerning your subscription. It helps us serve you promptly.

☐ Address change only ☐ Payment enclosed
☐ Extend subscription (1 extra BONUS issue)
☐ Enter new subscription ☐ Bill me later
☐ 1 year $24.97 (Canada $27.97, US funds, drawn on US bank only. Foreign surface $44.97 US funds. Foreign air mail please inquire.)

If you have no label handy, print OLD address here.

AFFIX LABEL

Name _____ Call _____
Address _____
City _____ State _____ Zip _____

print NEW address here:

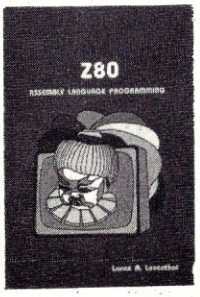
Name _____ Call _____
Address _____
City _____ State _____ Zip _____

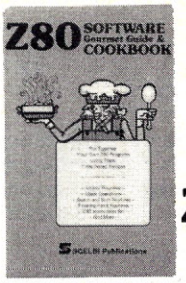
Microcomputing
P.O. Box 997 • Farmingdale NY 11737

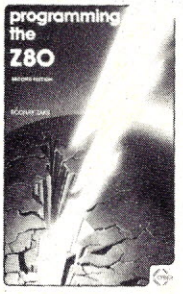
See List of Advertisers on page 130

microcomputing book nook

—PROGRAMMING—

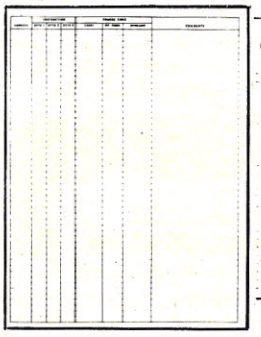


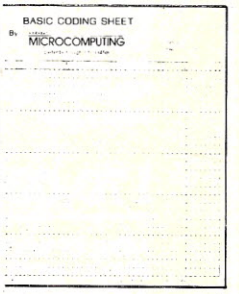




Z-80

—6502—





TRS-80 ASSEMBLY LANGUAGE—by Hubert S. Howe, Jr. This book incorporates into a single volume all the pertinent facts and information you need to know to program and enjoy the TRS-80. Included are clear presentations of all introductory concepts, completely tested practical programs and subroutines, details of ROM and RAM and disk operating systems, plus comprehensive tables, charts and appendices. Suitable for the first time user or more experienced users. BK1217 $9.95.*

INSIDE LEVEL II—For machine language programmers. This is a comprehensive reference guide to the Level II ROMs, allowing easy utilization of the sophisticated routines they contain. It concisely explains set-ups, calling sequences, variable passage and I/O routines. Part II presents an entirely new composite program structure which unloads under the SYSTEM command and executes in both BASIC and machine code with the speed and efficiency of a compiler. Special consideration is given to disk systems. BK1183 $15.95.*

PROGRAMMING THE Z-80—by Rodnay Zaks. Here is assembly language programming for the Z-80 presented as a progressive, step-by-step course. This book is both an educational text *and* a self-contained reference book, useful to both the beginning and the experienced programmer who wish to learn about the Z-80. Exercises to test the reader are included. BK1122 $15.95.*

Z-80 SOFTWARE GOURMET GUIDE AND COOKBOOK—by Nat Wadsworth. Scelbi's newest cookbook! This book contains a complete description of the powerful Z-80 instruction set and a wide variety of programming information. Use the author's ingredients including routines, subroutines and short programs, choose a time-tested recipe and start cooking! BK1045 $16.99.*

Z-80 ASSEMBLY LANGUAGE PROGRAMMING—by Lance A. Leventhal. This book thoroughly covers the Z-80 instruction set, abounding in simple programming examples illustrating software development concepts and actual assembly language usage. Features include Z-80 I/O devices and interfacing methods, assembler conventions, and comparisons with 8080A/8085 instruction sets and interrupt structure. BK1177 $16.99.*

AUDIO FREQUENCY TESTERS—Jam-packed with all kinds of audio frequency test equipment. If you're into SSB, RTTY, SSTV, etc., this book is a must for you . . . a good book for hi-fi addicts and experimenters, too! LB7360 $4.95.*

RADIO FREQUENCY TESTERS—Radio frequency waves, the common denominator of amateur radio. Such items as SWR, antenna impedance, line impedance, RF output, and field strength; detailed instructions on testing these items includes sections on signal generators, crystal calibrators, grid dip oscillators, noise generators, dummy loads, and much more. LB7361 $4.95.*

IC TEST EQUIPMENT—Become a troubleshooting wizard! Here are 42 home construction projects for building test equipment to work with your ham station and in servicing digital equipment. Plus a cumulative index for all four volumes for the *73* TEST EQUIPMENT LIBRARY. LB7362 $4.95.*

PET/CBM PERSONAL COMPUTER GUIDE—by Adam Osborne and Caroll Donahue. **REVISED SECOND EDITION** This is the book that will show you what the Commodore PET or CBM can do and how to get your's up and running. Designed as a self-teaching BASIC tutorial, the book will teach you both BASIC and CBM BASIC, yet it assumes no knowledge of computers or programming. Included are: complete operating instructions, Description of all PET/CBM BASIC statements, optimal programming techniques and solutions to many programming problems. BK1231 $15.00

SOME COMMON BASIC PROGRAMS, APPLE II EDITION—by Lon Poole et al. A powerful collection of financial, statistical, home management and mathematics programs—76 in all—Each program is presented with BASIC source code, operating instructions and descriptions. If you're a beginning programmer you can learn from this book what well designed and documented programs look like. BK1232 $14.95

UNDERSTANDING YOUR VIC VOL. 1:BASIC PROGRAMMING—by David Schultz. For the beginning VIC programmer—this book is full of examples and exercises (with expected results included as immediate feedback) that will help you to quickly and easily learn about the VIC. Included are chapters on program design with the use of pseudo code and data dictionaries to refine programming problems, and on VIC color and sound features. A fine learn-by-doing programming guide. BK1234 $11.95.

6502 ASSEMBLY LANGUAGE PROGRAMMING—by Lance A. Leventhal. This book provides comprehensive coverage of the 6502 microprocessor assembly language. Leventhal covers over 80 programming examples from simple memory load loops to complete design projects. Features include 6502 assembler conventions, input/output devices and interfacing methods and programming the 6502 interrupt system. BK1176 $16.99.*

THE APPLE II USER'S GUIDE—by Lon Poole, Martin McNiff, and Steven Cook. This guide is the key to unlocking the full power of your Apple II or Apple II Plus. Topics include: "Applesoft and Integer BASIC Programming"—especially how to make the best use of Apple's sound, color and graphics capabilities. "Machine Level Programming," "Hardware Features"—which covers the disk drive and printer, and "Advanced Programming"—describing high resolution graphics techniques and other advanced applications. Well organized and easy to use. BK1220 $15.00.*

PROGRAMMING THE 6502 (Third Edition)—Rodnay Zaks has designed a self-contained text to learn programming, using the 6502. It can be used by a person who has never programmed before, and should be of value to anyone using the 6502. The many exercises will allow you to test yourself and practice the concepts presented. $13.95.* BK1005

6502 APPLICATIONS BOOK—Rodnay Zaks presents practical-application techniques for the 6502 microprocessor, assuming an elementary knowledge of microprocessor programming. You will build and design your own domestic-use systems and peripherals. Self-test exercises included. BK1006 $12.95.*

6502 SOFTWARE GOURMET GUIDE AND COOKBOOK—by Robert Findley. This book introduces the BASIC language programmer into the realm of machine-language programming. The description of the 6502 structure and instruction set, various routines, subroutines and programs are the ingredients in this cookbook. "Recipes" are included to help you put together exactly the programs to suit your taste. BK1055 $12.95.*

***MICROCOMPUTING* CODING SHEETS** *Microcomputing*'s dozen or so programmers wouldn't try to work without these handy scratch pads, which help prevent the little errors that can cost hours and hours of programming time. Available for programming is Assembly/Machine Language (PD1001), which has columns for address, instruction (3 bytes), source code (label, op code, operand) and comments; and for BASIC (PD1002) which is 72 columns wide. 50 sheets to a pad. $2.39.*

68000/6809

6809 MICROCOMPUTER PROGRAMMING AND INTERFACING—by Andrew C. Staugaard, Jr. Getting involved with Tandy's new Color Computer? If so, this new book from the Blacksburg Group will allow you to exploit the awesome power of the machine's 6809 microprocessor. Detailed information on processor architecture, addressing modes, register operation, data movement, arithmetic logic operations, I/O and interfacing is provided, as well as a review section at the end of each chapter. Four appendices are included covering the 6809 instruction set, specification sheets of the 6809 family of processors, other 6800 series equipment and the 6809/6821 Peripheral Interface Adapter. This book is a must for the serious Color Computer owner. BK1215 $13.95.*

68000 MICROPROCESSOR HANDBOOK—by Gerry Kane. Whether you're currently using the 68000, planning to use it, or simply curious about one of the newest and most powerful microprocessors, this handbook has all the answers. A clear presentation of signal conversions, timing diagram conventions, functional logic, three different instruction set tables, exception processing, and family support devices provides more information about the 68000 than the manufacturer's data sheets. A stand alone reference book which can also be used as a supplement to *An Introduction to Microcomputers: Vol. 2—Some Real Microprocessors*. BK1216 $6.99.*

68000 ASSEMBLY LANGUAGE PROGRAMMING—by Gerry Kane, et al. A straightforward self teaching text book on assembly language programming for the 68000 microprocessor. This book contains the entire instruction set, describes the function of assemblers and assembly instructions and discusses basic software development concepts. A large number of practical programming examples are included. BK1233 $16.99

—COOKBOOKS—

CMOS COOKBOOK—by Don Lancaster. Details the application of CMOS, the low power logic family suitable for most applications presently dominated by TTL. Required reading for every serious digital experimenter! BK1011 $10.50.*

TTL COOKBOOK—by Don Lancaster. Explains what TTL is, how it works, and how to use it. Discusses practical applications, such as a digital counter and display system, events counter, electronic stopwatch, digital voltmeter and a digital tachometer. BK1063 $9.50.*

TVT COOKBOOK—by Don Lancaster. Describes the use of a standard television receiver as a microprocessor CRT terminal. Explains and describes character generation, cursor control and interface information in typical, easy-to-understand Lancaster style. BK1064 $9.95.*

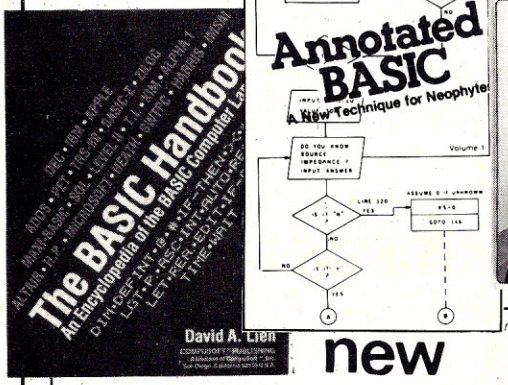
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to *Microcomputing* Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.50 for first book, $1.00 each additional book, $10.00 per book foreign airmail. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at this address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

microcomputing book nook

—BASIC & PASCAL—



new

ANNOTATED BASIC—A NEW TECHNIQUE FOR NEOPHYTES.—BASIC programming was supposed to be simple—a beginner's programming language which was so near to English that is could be easily understood. But, in recent years, BASIC has become much more powerful and therefore much more difficult to read and understand. BASIC simply isn't basic anymore.

Annotated BASIC explains the complexities of modern BASIC. It includes complete TRS-80* Level II BASIC programs that you can use. Each program is annotated to explain in step-by-step fashion the workings of the program. Programs are flowcharted to assist you in following the operational sequence. And—each chapter includes a description of the new concepts which have been introduced.

Annotated BASIC deals with the hows and whys of TRS-80 BASIC programming. *How* is a program put together? *Why* is it written that way? By observing the programs and following the annotation, you can develop new techniques to use in your own programs—or modify commercial programs for your specific use.
Annotated BASIC Volume 1 BK7384 $10.95
Annotated BASIC Volume 2 BK7385 $10.95
Order Both Volumes and Save! BK738402 $18.95

INTRODUCTION TO TRS-80 LEVEL II BASIC AND COMPUTER PROGRAMMING—by Michael P. Zabinski. Written by an experienced educator, this is the book for those beginners who want to learn about computers without having to become an expert. It has practical programs, useful line-by-line comments, excellent flowcharts accompanied by line numbers and over 200 exercises which help the reader assess progress, reinforce comprehension, and provide valuable practical experience. BK1219 $10.95.*

50 BASIC EXERCISES—by J. P. Lamoitier. This book is structured around the idea that the best way to learn a language is through actual practice. It contains 50 completely explained exercises: statement and analysis of the problem, flowcharts, programs and actual runs. Program subjects include mathematics, business, games, and operations research, and are presented in varying levels of difficulty. This format enables anyone to learn BASIC rapidly, checking their progress at each step. BK1192 $12.95*.

THE BASIC HANDBOOK—SECOND EDITION—by David Lien. This book is unique. It is a virtual ENCYCLOPEDIA of BASIC. While not favoring one computer over another, it explains over 250 BASIC words, how to use them and alternate strategies. If a computer does not possess the capabilities of a needed or specified word, there are often ways to accomplish the same function by using another word or combination of words. That's where the HANDBOOK comes in. It helps you get the most from your computer, be it a "bottom-of-the-line" micro or an oversized monster. BK1174 $19.95.*

LEARNING LEVEL II—by David Lien. Written especially for the TRS-80, this book concentrates on Level II BASIC. It explores every important BASIC language capability. Updates are included for those who have studied the Level I User's Manual. Sections include: how to use the Editor, dual cassette operation, printers and peripheral devices, and the conversion of Level I programs to Level II. BK1175 $15.95.*

BASIC BASIC (2ND EDITION)—by James S. Coan. This is a textbook which incorporates the learning of computer programming using the BASIC language with the teaching of mathematics. Over 100 sample programs illustrate the techniques of the BASIC language and every section is followed by practical problems. This second edition covers character string handling and the use of data files. BK1026 $10.50.*

ADVANCED BASIC—Applications including strings and files, coordinate geometry, area, sequences and series, simulation and graphing and games. BK1000 $10.75.*

INTRODUCTION TO PASCAL—by Rodnay Zaks. A step-by-step introduction for anyone wanting to learn the language quickly and completely. Each concept is explained simply and in a logical order. All features of the language are presented in a clear, easy-to-understand format with exercises to test the reader at the end of each chapter. It describes both standard PASCAL and UCSD PASCAL—the most widely used dialect for small computers. No computer or programming experience is necessary. BK1083 $14.95.*

PROGRAMMING IN PASCAL—by Peter Grogono. The computer programming language PASCAL was the first language to embody in a coherent way the concepts of structured programming, which has been defined by Edsger Dijkstra and C.A.R. Hoare. As such, it is a landmark in the development of programming languages. PASCAL was developed by Niklaus Wirth in Zurich; it is derived from the language ALGOL 60 but is more powerful and easier to use. PASCAL is now widely accepted as a useful language that can be efficiently implemented, and as an excellent teaching tool. It does not assume knowledge of any other programming language and therefore suitable for an introductory course. BK1140 $12.95.*

—GAMES—

40 COMPUTER GAMES FROM *KILOBAUD MICROCOMPUTING*—Forty games in all in nine different categories. Games for large and small systems, and even a section on calculator games. Many versions of BASIC used and a wide variety of systems represented. A must for the serious computer gamesman. BK7381 $7.95.*

BASIC COMPUTER GAMES—Okay, so once you get your computer and are running in BASIC, then what? Then you need some programs in BASIC, that's what. This book has 101 games for you from very simple to real buggers. You get the games, a description of the games, the listing to put in your computer and a sample run to show you how they work. Fun. Any one game will be worth more than the price of the book for the fun you and your family will have with it. BK1074 $7.50.*

MORE BASIC COMPUTER GAMES—Edited by David H. Ahl. More fun in BASIC! 84 new games from the people who brought you *BASIC Computer Games*. Includes such favorites as Minotaur (battle the mythical beast) and Eliza (unload your troubles on the doctor at bargain rates). Complete with game description, listing and sample run. BK1182 $7.50.*

WHAT TO DO AFTER YOU HIT RETURN—PCC's first book of computer games...48 different computer games you can play in BASIC...programs, descriptions and many illustrations. Lunar Landing, Hammurabi, King, Civel 2, Qubic 5, Taxman, Star Trek, Crash, Market, etc. **BK1071 $16.50.***

—BUSINESS—

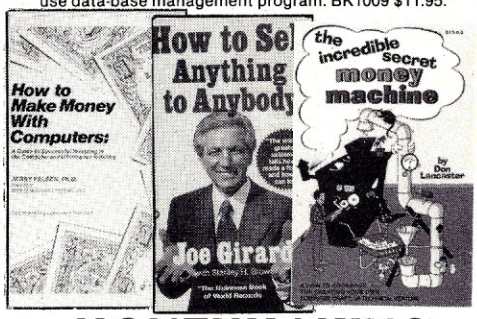
THEORY Z—How American Business Can Meet the Japanese Challenge—by William Ouchi. Why are the Japanese catching up and surpassing American industrial productivity? What allows Japanese industrialists to offer guaranteed lifetime employment to their workforce? This book will help you understand the Theory Z managerial philosophy and its implications for the American corporate future. Examples are given of the American industrial giants already operating under Z-style management, and the impact of this style on the quality of their executives and workers is explored. A must for the alert businessman, large or small. BK1226 $12.95*

SO YOU ARE THINKING ABOUT A SMALL BUSINESS COMPUTER—by Richard G. Canning and Nancy C. Leeper. For a well-organized manual on the process of selecting the right computer system for your small business, this text can't be excelled. Designed to introduce the novice in data and word processing to the real benefits of computerization, the book is filled with money- and time-saving tips, photos of equipment, lists of suppliers, prices, explanations of computer terminology, and helpful references to additional sources of information. Everyone contemplating a first computer installation should have this book. BK1222 $14.00*

PAYROLL WITH COST ACCOUNTING—IN BASIC— by L. Poole & M. Borchers, includes program listings with remarks, descriptions, discussions of the principle behind each program, file layouts, and a complete user's manual with step-by-step instructions, flowcharts, and simple reports and CRT displays. Payroll and cost accounting features include separate payrolls for up to 10 companies, time-tested interactive data entry, easy correction of data entry errors, job costing (labor of distribution), check printing with full deduction and pay detail, and 16 different printed reports, including W-2 and 941 (in **CBASIC**). BK1001 $20.00.*

SOME COMMON BASIC PROGRAMS— Published by Adam Osborne & Associates, Inc. Perfect for nontechnical computerists requiring ready-to-use programs. Business programs, plus miscellaneous programs. Invaluable for the user who is not an experienced programmer. All will operate in the stand-alone mode. BK1053 $14.99

PIMS: PERSONAL INFORMATION MANAGEMENT SYSTEM—Learn how to unleash the power of a personal computer for your own benefit in this ready-to-use data-base management program. BK1009 $11.95.*



—MONEYMAKING—

HOW TO MAKE MONEY WITH COMPUTERS—In 10 information-packed chapters, Jerry Felsen describes more than 30 computer-related, money-making, high profit, low capital investment opportunities. BK1003 $15.00.*

HOW TO SELL ANYTHING TO ANYBODY—According to *The Guinness Book of World Records*, the author, Joe Girard, is "the world's greatest salesman." This book reveals how he made a fortune—and how you can, too. BK7306 $2.25.*

THE INCREDIBLE SECRET MONEY MACHINE—by Don Lancaster. A different kind of "cookbook" from Don Lancaster. Want to slash taxes? Get free vacations? Win at investments? Make money from something that you *like* to do? You'll find this book essential to give you the key insider details of what is really involved in starting up your own money machine. BK1178 $5.95.*

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to *Microcomputing* Book Department ● Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.50 for first book, $1.00 each additional book, $10.00 per book foreign airmail. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at this address.

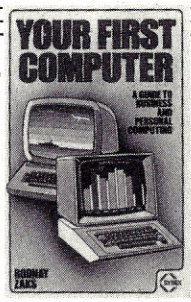
FOR TOLL FREE ORDERING CALL 1-800-258-5473

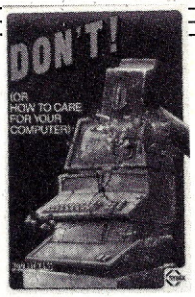
microcomputing book nook

—INTRODUCTORY—

UNDERSTANDING AND PROGRAMMING MICROCOMPUTERS—A valuable addition to your computing library. This two part text includes the best articles that have appeared in 73 and Kilobaud Microcomputing magazines on the hardware and software aspects of microcomputing. Well known authors and well structured text helps the reader get involved. BK7382 $10.95.*

SOME OF THE BEST FROM KILOBAUD/MICROCOMPUTING—A collection of the best articles that have recently appeared in Kilobaud/MICROCOMPUTING. Included is material on the TRS-80 and PET systems, CP/M, the 8080/8085/Z80 chips, the ASR-33 terminal. Data base management, word processing, text editors and file structures are covered too. Programming techniques and hardcore hardware construction projects for modems, high speed cassette interfaces and TVTs are also included in this large format, 200 plus page edition. BK7311 $10.95.*





DON'T (or How to Care for Your Computer)—by Rodnay Zaks. In plain language, with numerous illustrations, this book tells all the do's and don't's of the care, preservation and correct operation of the small computer system. Specific chapters cover each piece of hardware and software, as well as safety and security precautions and help for problem situations. Have your computer work right the first time and keep it working. No technical background required. For all computer users. BK1237 $11.95.

YOUR FIRST COMPUTER—by Rodnay Zaks. Whether you are using a computer, thinking about using one or considering purchasing one, this book is indispensable. It explains what a computer system is, what it can do, how it works and how to select various components and peripheral units. It is written in everyday language and contains invaluable information for the novice and the experienced programmer. (The first edition of this book was published under the title "An Introduction to Personal and Business Computing".) BK1191 $8.95*

MICROPROCESSOR INTERFACING TECHNIQUES—by Austin Lesea & Rodnay Zaks—will teach you how to interconnect a complete system and interface it to all the usual peripherals. It covers hardware and software skills and techniques, including the use and design of model buses such as the IEEE 488 or S-100. BK1037 $17.95.*

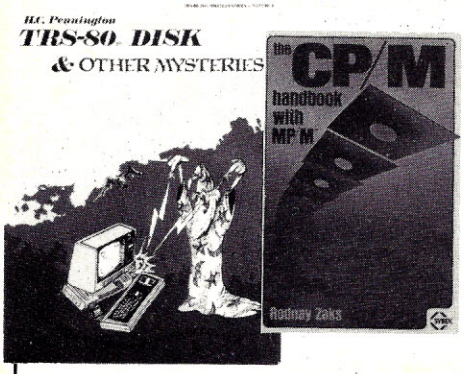
HOBBY COMPUTERS ARE HERE!—If you want to come up to speed on how computers work— hardware and software—this is an excellent book. It starts with fundamentals and explains the circuits and the basics of programming, along with a couple of TVT construction projects, ASCII, Baudot, etc. This book has the highest recommendations as a teaching aid. BK7322 $4.95.*

THE NEW HOBBY COMPUTERS—This book takes it from where Hobby Computers Are Here! leaves off, with chapters on Large-Scale Integration, how to choose a microprocessor chip, an introduction to programming, low-cost I/O for a computer, computer arithmetic, checking memory boards. . . and much, much more! Don't miss this tremendous value! BK7340 Only $4.95.*

AN INTRODUCTION TO MICROCOMPUTERS, VOL. 0—The Beginner's Book—Written for readers who know nothing about computers—for those who have an interest in how to use computers—and for everyone else who must live with computers and should know a little about them. The first in a series of 4 volumes, this book will explain how computers work and what they can do. Computers have become an integral part of life and society. During any given day you are affected by computers, so start learning more about them with Volume 0. BK1130 $7.95.*

AN INTRODUCTION TO MICROCOMPUTERS, VOL. 1—2nd Edition completely revised. Dedicated to the basic concepts of microcomputers and hardware theory. The purpose of Volume I is to give you a thorough understanding of what microcomputers are. From basic concepts (which are covered in detail), Volume I builds the necessary components of a microcomputer system. This book highlights the difference between minicomputers and microcomputers. BK1030 $12.99.*

—SPECIAL INTERESTS—



TRS-80 DISK AND OTHER MYSTERIES—by Harvard C. Pennington. This is the definitive work on the TRS-80 disk system. It is full of detailed "How to use," information with examples, samples and in-depth explanations suitable for beginners and professionals alike. The recovery of one lost file is worth the price alone. BK1181 $22.50.*

MICROSOFT BASIC DECODED AND OTHER MYSTERIES—by James Farvour. From the company that brought you *TRS-80 DISK AND OTHER MYSTERIES*. Contains more than 6500 lines of comments for the disassembled Level II ROMs and six additional chapters describing every BASIC subroutine, with assembly language routines showing how to use them. Flowcharts for all major routines give the reader a real insight into how the interpreter works. BK1186 $29.50.*

THE CUSTOM TRS-80 AND OTHER MYSTERIES—by Dennis Kitsz. More than 300 pages of TRS-80 customizing information. With this book you'll be able to explore your computer like never before. Want to turn an 8 track into a mass storage unit? Individual reverse characters? Replace the BASIC ROMs? Make Music? High speed, reverse video, Level I and Level II? Fix it if it breaks down? All this and much, much more. Even if you have never used a soldering iron or read a circuit diagram, this book will teach you how! This is the definitive guide to customizing your 80! BK1218 $29.95.*

BASIC FASTER AND BETTER AND OTHER MYSTERIES—by Lewis Rosenfelder. You don't have to learn assembly language to make your programs run fast. With the dozens of programming tricks and techniques in this book you can sort at high speed, swap screens in the twinkling of an eye, write INKEY routines that people think are in assembly language and add your own commands to BASIC. Find out how to write elegant code that makes your BASIC really hum, and explore the power of USR calls. BK1221 $29.95.*

THE CP/M HANDBOOK (with MP/M)—by Rodnay Zaks. A complete guide and reference handbook for CP/M—the industry standard in operating systems. Step-by-step instruction for everything from turning on the system and inserting the diskette to correct user discipline and remedial action for problem situations. This also includes a complete discussion of all versions of CP/M up to and including 2.2, MP/M and CDOS. BK1187 $14.95.*

HOW TO DEFEND YOURSELF AGAINST RADAR—by Bruce F. Bogner and James R. Bodnar, a lawyer and radar expert. This book gives you the ammunition to challenge the radar "evidence" that usually leads to a speeding conviction. The major part of the book details the inner workings of radar—you'll become more of an expert than most police officers and judges. The remainder of the book outlines how to defend yourself against a speeding ticket—the observations, measures and testimony you must obtain to defend yourself without the help of a lawyer. The price is a lot less than a fine! BK1201 $6.95.*

NEW

INTRODUCTION TO WORD PROCESSING by Hal Glatzer. This book explains in plain language what a word processor can do, how to use one, how it improves productivity—especially in businesses that handle lots of words—and how to buy one wisely. No technical knowledge required, for all first-time users and those considering purchasing a word processor. BK1238 $12.95

NEW

A USER GUIDE TO THE UNIX SYSTEM by Jean Yates and Rebecca Thomas. Here at last is a clearly written book that allows you to use the Unix operating system easily, and at a fraction of the time it previously took. If you're using, evaluating or simply curious about this system, this is your book. BK1242 $15.99

NEW

WORDSTAR MADE EASY by Walter A. Ettlin. Now WordStar is as simple to learn as it is easy to use. This book teaches WordStar in 14 easy lessons, saving hours of hard work. It comes with a convenient pull-out Command Card. BK1239 $7.95

KILOBAUD KLASSROOM—by George Young and Peter Stark. Learning electronics theory without practice isn't easy. And it's no fun to build an electronics project that you can't use. *Kilobaud Klassroom* the popular series first published in *Kilobaud Microcomputing*, combines theory with practice. This is a *practical* course in digital electronics. It starts out with very simple electronics projects, and by the end of the course you'll construct your own working microcomputer!

Authors Young and Stark are experienced teachers, and their approach is simple and direct. Whether you're learning at home or in the classroom, this book provides you with a solid background in electronics—and you'll own a computer that you built yourself! BK7386 $14.95

TOOLS & TECHNIQUES FOR ELECTRONICS—by A. A. Wicks is an easy-to-understand book written for the beginning kit-builder as well as the experienced hobbyist. It has numerous pictures and descriptions of the safe and correct ways to use basic and specialized tools for electronic projects, as well as specialized metalworking tools and the chemical aids which are used in repair shops. BK7348 $4.95.*

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

✓85

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to *Microcomputing* Book Department ● Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.50 for first book, $1.00 each additional book, $10.00 per book foreign airmail. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at this address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

Why use their flexible discs:

Athana, BASF, Control Data, Dysan, IBM, Maxell, Nashua, Scotch, Shugart, Syncom, 3M, Verbatim or Wabash

when you could be using

MEMOREX

high quality error free discs?

Product Description	Part #	CE quant. 100 price per disc ($)
8″ SSSD IBM Compatible (128 B/S, 26 Sectors)	**3062**	2.09
8″ SSSD Shugart Compatible, 32 Hard Sector	**3015**	2.09
8″ SSDD IBM Compatible (128 B/S, 26 Sectors)	**3090**	2.74
8″ DSDD Soft Sector (Unformatted)	**3102**	3.14
8″ DSDD Soft Sector (128 B/S, 26 Sectors)	**3115**	3.34
8″ DSDD Soft Sector (1024 B/S, 8 Sectors)	**3104**	3.34
8″ DSDD Burroughs B-80 Comp., 32 Hard Sector	**3092**	3.34
5¼″ SSSD Soft Sector (Unformatted)	**3401**	1.94
5¼″ SSDD Soft Sector w/Hub Ring	**3481**	2.34
5¼″ SSDD 10 Hard Sector w/Hub Ring	**3483**	2.34
5¼″ SSDD 16 Hard Sector w/Hub Ring	**3485**	2.34
5¼″ DSDD Soft Sector w/Hub Ring	**3491**	3.09
5¼″ DSDD 10 Hard Sector w/Hub Ring	**3493**	3.09
5¼″ DSDD 16 Hard Sector w/Hub Ring	**3495**	3.09

SSSD = Single Sided Single Density; SSDD = Single Sided Double Density
DSDD = Double Sided Double Density

Memorex Flexible Discs...The Ultimate in Memory Excellence

Quality
Memorex means quality products that you can depend on. Quality control at Memorex means starting with the best materials available. Continual surveillance throughout the entire manufacturing process. The benefit of Memorex's years of experience in magnetic media production, resulting, for instance, in proprietary coating formulations. The most sophisticated testing procedures you'll find anywhere in the business.

100 Percent Error Free
Each and every Memorex Flexible Disc is certified to be 100 percent error free. *Each* track of *each* flexible disc is tested, individually, to Memorex's stringent standards of excellence. They test signal amplitude, resolution, low-pass modulation, overwrite, missing pulse error and extra pulse error. They are torque-tested, and competitively tested on drives available from almost every major drive manufacturer in the industry including drives that Memorex manufacturers. Rigid quality audits are built into every step of the manmanufacturing process and stringent testing result in a standard of excellence that assures you, our customer, of a quality product designed for increased data reliability and consistent top performance.

Customer-Oriented Packaging
Memorex's commitment to excellent does not stop with a quality product. They are proud of their flexible discs and they package them with pride. Both their packaging and their labeling have been designed with your ease of identification and use in mind. The desktop box containing ten discs is convenient for filing and storage. Both box labels and jacket labels provide full information on compatibility, density, sectoring, and record length. Envelopes with multi-language care and handling instructions and and color-coded removable labels are included. A write-protect feature is available to provide data security.

Full One Year Warranty—Your Assurance of Quality
Memorex Flexible Discs will be replaced free of charge by Memorex if they are found to be defective in materials or workmanship within one year of the date of purchase. Other than replacement, Memorex will not be responsible for any damages or losses (including consequential damages) caused by the use of Memorex Flexible Discs.

Quantity Discounts Available
Memorex Flexible Discs are packed 10 discs to a carton and 10 cartons to a case. Please order only in increments of 100 units for quantity 100 pricing. We are also willing to accommodate your smaller orders. Quantities less than 100 units are available in increments of 10 units at a 10% surcharge. **Quantity discounts** are also available. Order 500 or more discs at the same time and deduct 1%; 1,000 or more saves you 2%; 2,000 or more saves you 3%; 5,000 or more saves you 4%; 10,000 or more saves you 5%; 25,000 or more saves you 6%; 50,000 or more saves you 7% and 100,000 or more discs earns you an 8% discount off our super low quantity 100 price. Almost all Memorex Flexible Discs are immediately available from **CE**. Our warehouse facilities are equipped to help us get you the quality product you need, when you need it. If you need further assistance to find the flexible disc that's right for you, call the Memorex compatibility hotline. Dial 800-538-8080 and ask for the *flexible disc hotline* extension 0997. In California dial 800-672-3525 extension 0997. Outside the U.S.A. dial 408-987-0997.

Buy with Confidence
To get the fastest delivery from **CE** of your Memorex Flexible Discs, send or phone your order directly to our Computer Products Division. Be sure to calculate your price using the **CE** prices in this ad. Michigan residents please add 4% sales tax. Written purchase orders are accepted from approved government agencies and most well rated firms at a 30% surcharge for net 30 billing. All sales are subject to availability, acceptance and verification. All sales are final. Prices, terms and specifications are subject to change without notice. Out of stock items will be placed on backorder automatically unless **CE** is instructed differently. Minimum order $50.00. International orders are invited with a $20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

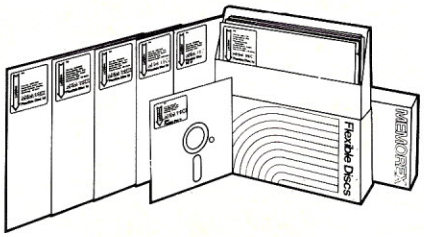
Mail orders to: **Communications Electronics**, Box 1002, Ann Arbor, Michigan 48106 U.S.A. Add $8.00 per case or partial-case of 100 8-inch discs or $6.00 per case or partial case of 100 5¼-inch mini-discs for U.P.S. *ground* shipping and handling in the continental U.S.A. If you have a Master Card or Visa card, you may call anytime and place a credit card order. **Order toll-free** in the U.S. Call anytime 800-521-4414. If you If you are outside the U.S. or in Michigan, dial 313-994-4444. Order your high quality, error free Memorex discs today.

Copyright ©1982 Communications Electronics™

High Quality Error Free

MEMBER DIRECT MAIL MARKETING ASSOCIATION · CODE OF ETHICS · VISA · MasterCard

Order Toll-Free!
(800) 521-4414
In Michigan (313) 994-4444



For Data Reliability—Memorex Flexible Discs

COMMUNICATIONS ELECTRONICS™ ✓376

Computer Products Division

854 Phoenix □ Box 1002 □ Ann Arbor, Michigan 48106 U.S.A.
Call TOLL-FREE (800) 521-4414 or outside U.S.A. (313) 994-4444

✓See List of Advertisers on page 130

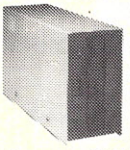
WE WILL NOT BE UNDERSOLD

CP/M® Software	Software/Manual only
Digital Research	
PL/I-80	$459/$35
BT-80	$179/$30
Mac	$ 85/$15
Sid	$ 65/$15
Z-Sid	$ 90/$15
Tex	$ 90/$15
DeSpool	$ 50/$10
Micropro	
WordStar	$319/$60
Customization Notes	$489/$na
Mail-Merge	$109/$25
WordStar/Mail-Merge	$419/$85
DataStar	$249/$60
WordMaster	$119/$40
SuperSort I	$199/$40
Spell Star	$175/$40
Microsoft	
Basic-80	$289/$na
Basic Compiler	$329/$na
Fortran-80	$349/$na
Cobol-80	$574/$na
M-Sort	$124/$na
Macro-80	$144/$na
Edit-80	$ 84/$na
MuSimp/MuMath	$224/$na
MuLisp-80	$174/$na
Organic Software	
Milestone	$269/$30
Supersoft	
Diagnostic I	$ 49/$20
Diagnostic II	$ 84/$20
Disk Doctor	$ 84/$20
Forth (8080 or Z80)	$149/$30
Fortran	$219/$30
Fortran w/Ratfor	$289/$35
Unicorn	
Mince	$149/$25
Scribble	$149/$25
Both	$249/$50
Data Base	
FMS-80	$649/$45
dBASE II	$595/$50
Access/80	$699/$50
Pascal	
Pascal/MT+	$429/$30
Pascal/M	$189/$20
Miscellaneous	
SpellGuard	$299/$25
SuperCalc	$269/$50
CBASIC-2	$ 98/$20
MicroStat	$224/$25
StatPak	$449/$40
Micro B+	$229/$20

Apple Software (Business)	
Micropro	
Wordstar	$289
MailMerge	$119
Wordstar/MailMerge	$389
SuperSort I	$189
Spellstar	$139
Personal Software	
Visicalc 3.3	$229
CCA Data Mgr	$ 84
Desktop/Plan II	$229
Visiterm	$139
Visidex	$229
Visiplot	$185
Visitrend/Visiplot	$275
Zork	$ 34
Miscellaneous	
Micro Courier	$219
Super-Text II	$127
ASCII Express	$ 59

Apple Software (Entertainment)	
Wizard & Princess	$ 28
Mystery House	$ 24
Flight Simulator	$ 32
Raster Blaster	$ 29
Space Eggs	$ 26
Sargon II	$ 29
ABM	$ 22
Pool 1.5	$ 26
Beer Run	$ 28
Epoch	$ 32
Sneakers	$ 27
Midnight Magic	$ 32
Wizardry	$ 45
Apple Accessories	
Z-80 Softcard by Microsoft	$ 299
Keyboard Enhancer	$ 119
T & G Joystick	$ 49
Sup-r Mod	$ 25
CPS Multifunction Card	$ 199
Videoterm by Videx	$ 249
16K Card by Microsoft	$ 159
Sup-r Fan	$ 39
ALF9 Voice Board	$ 149
CCS Cards	$Call
CCS Parallel Model 7720	$Call
CCS Serial Model 7710D	$Call
CCS Centronics Model 7728	$Call

Disk Drives For TRS-80* Model 1



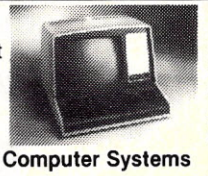
CCI-100 5¼", 40 Track	$ 299
Add-ons for Zenith Z-89	
CCI-189 5¼", 40 Track	$ 455
Z-87 Dual 5¼" system	$ 995
Drives for Z-90	$Call

External card edge and power supply included. 90 day warranty/one year on power supply.

Corvus 5M	**$ 3089**
Corvus 10M	**$ 4489**
Corvus 20M	**$ 5429**
Corvus Mirror	**$ 699**
Shugart 8" 801R Raw Drive	$ 399
TANDON 5¼" Raw Drive	$ Call
Power Supplies	$ Call
Diskettes—Box of 10	
Maxell 5¼"	$ 40
Maxell 8"	$ 45
BASF/Verbatim 5¼"	$26.95
BASF/Verbatim 8"	$ 36
Plastic File Box—Holds 50 5¼" dskts.	$ 19
Plastic Library Case 5¼"	$ 3
Plastic Library Case 8"	$ 4
Head Cleaning Diskette	$ 25
Floppy Saver	$10.95
Floppy Saver Rings	$ 6.95
16K RAM Kits	
One Kit	$19.00
Two Kits	$37.00
200ns for TRS-80*, Apple II, (specify): Jumpers	$ 2.50
Computer Systems	
Atari 400	$ 359
Atari 800	$ 699
Call for other Atari products	
Zenith Z89, 48K	$ Call
Zenith Z90, 64K	$ Call
Call for other Zenith products	

For fast delivery, send certified checks, money orders or call to arrange direct bank wire transfers. Personal or company checks require one to three weeks to clear. All prices are **mail order only** and are subject to change without notice. **Call for shipping charges.**

Terminals



ADDS Viewpoint	$ Call
Zenith Z-19	$ 699
Televideo 910	$ 595
Televideo 920C	$ 769
Televideo 950	$ 969

S-100 California Computer Systems	
Mainframe	$ 349
Z80 CPU	$ 239
64K RAM	$ 569
Floppy Disc Cntrl	$ 339
Integrated Sys. w/int. cables, tstd.	$1975
2P + 2S I/O	$ 269
4 Port Serial I/O	$ 249
4 Port Parallel I/O	$ 179

Casio Calculators		
Pocket Comp.	FX702	$185.00
Desk Printr/Calc.	FR100	$ 79.95
Scientific Calc.	FX8100	$ 49.95
Game Watch	CA90 Plastic	$ 49.95
Game Watch	CA901 Steel	$ 69.95
Calendar Watch	AX210	$ 59.95

Printers

NEC Spinwriter	
7710 R.O. Ser	$2395
7710 Ser w/tr.	$2595
7720 KSR w/tr.	$2795
7730 R.O. Par	$2395
7730 R.O. Par w/tr.	$2595
NEW 3500 Series	**$ Call**
Epson MX-70	**$ Call**
Epson MX-80	**$ Call**
Epson MX-80FT	**$ Call**
Epson MX-100	**$ Call**
Epson Graftrax	**$ Call**
PaperTiger 560 Gr. & 2K	$ Call
IDS Prism 80	$ Call
IDS Prism 132	$ Call
PaperTiger Access.	$ Call
Anadex DP-8000	$ 949
Anadex DP-9500/01	$1465
Okidata Microline 80 Fric. & pin feed	$ Call
Okidata Microline 82A Fric. & pin feed	$ Call
Okidata Microline 83A 120 cps	$ Call
Okidata 84 200 cps	$ Call
Centronics 739	$ 739
Data South 180 cps	$ Call

Monitors	
Leedex 12" B&W	$ 119
Leedex 12" Green Screen	$ 129
Leedex 13" Color	$ 329
Sanyo 9" B&W	$ 149
Sanyo 9" Green Screen	$ 189
Sanyo 12" Green Screen	$ 249
Sanyo 12" B&W	$ 239
Sanyo 13" Color	$ 449
Zenith 12" Green Screen	$ 129
Zenith 13" Color	$ 349

******** Special of the Month ********
Olivetti DY 211 Daisy Wheel
$Call

Telecommunications	
Prentice Star Modem 1-yr. guar.	$ 125
Univ. Data System UDS103LP	$ 135
Univ. Data System UDS103JP	$ 189
Novation Cat	$ 139
Novation D-Cat	$ 149
Novation Auto-Cat	$ 199
Novation Apple Cat II	$ 299
Hayes Smart Modem™	$ 249
Hayes Micro-Modem II™	$ 310
Hayes Chronograph™	$ 225
CCI Telnet Com. Package	$ 135

DEALER (NATIONAL/INTERNATIONAL) INQUIRIES INVITED **Send for FREE Catalogue**

The CPU SHOP

TO ORDER CALL TOLL FREE 1-800-343-6522
TWX: 710-348-1796 Massachusetts Residents call 617/242-3361

420-438 Rutherford Ave., Dept. KO5M
Charlestown, Massachusetts 02129
Hours 9 AM-9 PM (EST) Mon.-Fri. (Sat. till 6)

Technical Information call 617/242-3361
Massachusetts Residents add 5% Sales Tax
Tandy Corporation Trademark/* Digital Research

master charge THE INTERBANK CARD
VISA

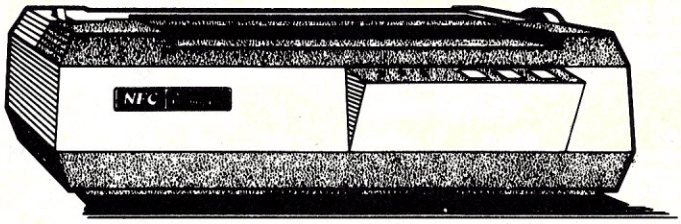
ELECTRONICS CENTER

25

CALL TOLL FREE

1-800-228-4097

Electronics Center is Proud to Offer Name Brand Equipment at Discount Prices. Call Today for your Computer Needs and Unadvertised Specials.



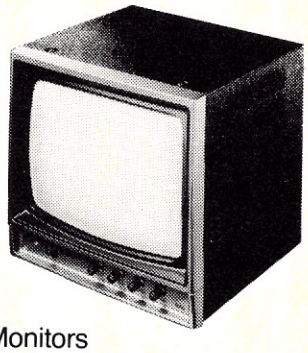
NEC PC-8023A Printer

A dot-matrix, bi-directional, logic-seeking, friction or tractor feed, impact printer.

EPSON Printers
CALL FOR PRICE

Commodore VIC–20
Call Toll Free For Price

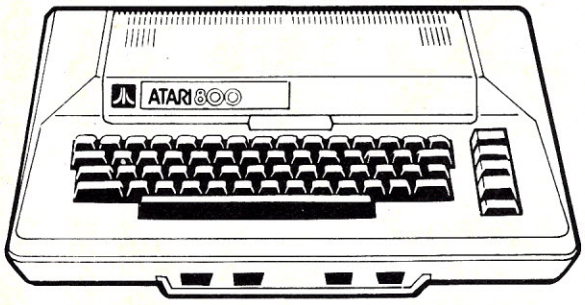
DC Hayes Micromodem II
CALL FOR PRICES



NEC Monitors

9" NEC Monitor	$139.95
12" NEC Monitor	$179.95
12" Green Screen	CALL
13" NEC Color Monitor With Tuner	$499.95
19" NEC Color Monitor	$499.95

ATARI



Atari Computers Our Atari Prices Can't Be Beat!

PRICES SUBJECT TO CHANGE AND AVAILABILITY

YOUR ELECTRONICS PLAYGROUND

1840 "O" Street Lincoln, Nebraska 68508
In Nebraska Call (402) 476-7331

master charge THE INTERBANK CARD

VISA

See List of Advertisers on page 130

16K Memory

4116-200ns **8/15.95**

ALL MERCHANDISE 100% GUARANTEED!

CALL US FOR VOLUME QUOTES

EPROMS

			Each	8 pcs
1702	256 x 8	(1ns)	4.95	4.50
2708	1024 x 8	(450ns)	2.99	2.75
2758	1024 x 8	(5V) (450ns)	9.95	8.95
TMS2516	2048 x 8	(5V) (450ns)	6.95	5.95
2716	2048 x 8	(5V) (450ns)	5.50	4.95
2716-1	2048 x 8	(5V) (350ns)	9.00	8.50
TMS2716	2048 x 8	(450ns)	9.95	8.95
TMS2532	4096 x 8	(5V) (450ns)	12.95	11.95
2732	4096 x 8	(5V) (450ns) (200ns)		CALL
2764	8192 x 8	(5V) (450ns)		CALL

DYNAMIC RAMS

				100 pcs
4027	4096 x 1	(250ns)	2.50	2.00
4116-120	16,384 x 1	(120ns)	8/29.95	CALL
4116-150	16,384 x 1	(150ns)	8/18.95	1.95
4116-200	16,384 x 1	(200ns)	8/15.95	1.80
4116-300	16,384 x 1	(300ns)	8/14.95	1.75
4164	64,536 x 1	(200ns)		CALL

STATIC RAMS

				100 pcs
2101	256 x 4	(450ns)	1.95	1.85
2102-1	1024 x 1	(450ns)	.89	.85
21L02-4	1024 x 1	(LP) (450ns)	1.29	1.15
21L02-2	1024 x 1	(LP) (250ns)	1.69	1.55
2111	256 x 4	(450ns)	2.99	2.49
2112	256 x 4	(450ns)	2.99	2.79
2114	1024 x 4	(450ns)	8/16.95	1.95
2114L-2	1024 x 4	(LP) (200ns)	8/19.95	2.35
2114L-3	1024 x 4	(LP) (300ns)	8/18.95	2.25
2114L-4	1024 x 4	(LP) (450ns)	8/17.95	2.10
2147	4096 x 1	(55ns)	9.95	CALL
TMS4044-4	4096 x 1	(450ns)	3.49	3.25
TMS4044-3	4096 x 1	(300ns)	3.99	3.75
TMS40L44-2	4096 x 1	(LP) (200ns)	4.49	4.25
TMM2016	2048 x 8	(200ns) (150ns)		CALL
HM6116	2048 x 8	(200ns) (150ns) (120ns)		CALL

LP = LOW POWER

74LS00 SERIES

74LS00	.25	74LS85	1.15	74LS166	2.40	74LS293	1.85
74LS01	.25	74LS86	.40	74LS168	1.75	74LS295	1.05
74LS02	.25	74LS90	.65	74LS169	1.75	74LS298	1.20
74LS03	.25	74LS91	.89	74LS170	1.75	74LS324	1.75
74LS04	.25	74LS92	.70	74LS173	.80	74LS352	1.55
74LS05	.25	74LS93	.65	74LS174	.95	74LS353	1.55
74LS08	.35	74LS95	.85	74LS175	.95	74LS363	1.35
74LS10	.25	74LS96	.95	74LS181	2.15	74LS364	1.95
74LS11	.35	74LS107	.40	74LS189	9.95	74LS365	.95
74LS12	.35	74LS109	.40	74LS190	1.00	74LS366	.95
74LS13	.45	74LS112	.45	74LS191	1.00	74LS367	.70
74LS14	1.00	74LS113	.45	74LS192	.85	74LS368	.70
74LS15	.35	74LS114	.50	74LS193	.95	74LS373	.99
74LS20	.25	74LS122	.45	74LS194	1.00	74LS374	1.75
74LS21	.35	74LS123	.95	74LS195	.95	74LS377	1.45
74LS22	.25	74LS124	2.99	74LS196	.85	74LS378	1.18
74LS26	.35	74LS125	.95	74LS197	.85	74LS379	1.35
74LS27	.35	74LS126	.85	74LS221	1.20	74LS385	1.90
74LS28	.35	74LS132	.75	74LS240	.99	74LS386	.65
74LS30	.25	74LS136	.55	74LS241	.99	74LS390	1.90
74LS32	.35	74LS137	.99	74LS242	1.85	74LS393	1.90
74LS33	.55	74LS138	.75	74LS243	1.85	74LS395	1.65
74LS37	.55	74LS139	.75	74LS244	.99	74LS399	1.70
74LS38	.35	74LS145	1.20	74LS245	1.90	74LS424	2.95
74LS40	.35	74LS147	2.49	74LS247	.76	74LS447	.37
74LS42	.55	74LS148	1.35	74LS248	1.25	74LS490	1.95
74LS47	.75	74LS151	.75	74LS249	.99	74LS668	1.69
74LS48	.75	74LS153	.75	74LS251	1.30	74LS669	1.89
74LS49	.75	74LS154	2.35	74LS253	.85	74LS670	2.20
74LS51	.25	74LS155	1.15	74LS257	.85	74LS674	9.65
74LS54	.35	74LS156	.95	74LS258	.85	74LS682	3.20
74LS55	.35	74LS157	.75	74LS259	2.85	74LS683	2.30
74LS63	1.25	74LS158	.75	74LS260	.65	74LS684	2.40
74LS73	.40	74LS160	.90	74LS266	.55	74LS685	2.40
74LS74	.45	74LS161	.95	74LS273	1.65	74LS688	2.40
74LS75	.50	74LS162	.95	74LS275	3.35	74LS689	2.40
74LS76	.40	74LS163	.95	74LS279	.55	81LS95	1.69
74LS78	.50	74LS164	.95	74LS280	1.98	81LS96	1.69
74LS83	.75	74LS165	.95	74LS283	1.00	81LS97	1.69
				74LS290	1.25	81LS98	1.69

CRYSTALS

32.768 KHZ	3.95
1.0 MHZ	4.95
1.8432	4.95
2.0	3.95
2.097152	3.95
2.4576	3.95
3.2768	3.95
3.579545	3.95
4.0	3.95
5.0	3.95
5.0688	3.95
5.185	3.95
5.7143	3.95
6.5536	3.95
8.0	3.95
10.0	3.95
14.31818	3.95
18.0	3.95
18.432	3.95
20.0	3.95
22.1184	3.95
32.0	3.95

MISC.

AY5-2376	12.50
11C90	13.95
XR2206	4.95
3242	7.95
3480	9.00
MC4024	3.95
MC4044	4.50
7103	9.50
7106	9.95
7107	12.95
76477	3.95
8038	3.95
95H90	7.99
9602	1.50

DISC CONTROLLERS

1771	24.95
1791	36.95
1793	44.95
1797	54.95
UPD765	39.95

UARTS

AY3-1014	6.95
AY5-1013	3.95
TR1602	4.95
IM6402	7.95

INTERFACE

8T26	1.69
8T28	2.49
8T95	.99
8T96	.99
8T97	.99
8T98	.99
DM8131	2.95
DS8836	1.29

CLOCK CIRCUITS

MM5369	3.95
MM5375	3.95
MSM5832	7.45
7207	7.50
7208	15.95

CONVERTERS

MC1408 L8	4.95
DAC-0800	4.95
ADC-0804	4.95

MAY SPECIALS

16K APPLE* RAM CARD

- ★ Upgrade your 48K Apple II to full 64K.
- ★ Fully software and hardware compatible with Apple language card and microsoft 280 card.
- ★ Eliminates the need for Applesoft or Integer Basic ROM card when used in conjunction with DOS 3.3.
- ★ Allows you to run Apple Fortran or Pascal.
- ★ Available as bare board, kit, or completed and tested board.

BARE BOARD	**$ 40.00**
KIT	**89.95**
ASSEMBLED & TESTED	**109.95**
6883 SAM	**24.95**
RS232 FEMALE	**3.49**
RS232 RIGHT ANGLE FEMALE	**4.95**
RS232 MALE	**2.99**
RS232 HOOD	**.99**

Specials end May 31, 1982. Please state "May Specials" when ordering.

6502

6502	6.95
6502-A	12.95
6504	6.95
6505	8.95
6507	9.95
6520	4.35
6522	9.95
6532	14.95
6551	11.85

Z80

Z80-CPU	8.95
Z80A-CPU	6.00
Z80-P10	6.50
Z80A-P10	6.00
Z80-CTC	5.95
Z80A-CTC	8.65
Z80-DART	15.25
Z80A-DART	18.75
Z80-DMA	17.50
Z80A-DMA	27.50
Z80-S10/0	23.95
Z80A-S10/0	28.95
Z80-S10/1	23.95
Z80A-S10/1	28.95
Z80-S10/2	23.95
Z80A-S10/2	28.95
Z80-S10/09	17.95
Z80A-S10/9	22.95
Z80B-CPU	18.95
Z80B-CTC	17.95
Z80B-P10	17.95
Z8671	39.95
Z6132	34.95

CMOS

74C00	.35	74C374	2.75	4019	.45	4098	2.49
74C02	.35	74C901	.80	4020	.95	4099	1.95
74C04	.35	74C902	.85	4021	.95	14409	12.95
74C08	.35	74C903	.85	4022	1.15	14410	12.95
74C10	.35	74C905	10.95	4023	.35	14411	11.95
74C14	1.50	74C906	.95	4024	.75	14412	12.95
74C20	.35	74C907	1.00	4025	.35	14419	4.95
74C30	.35	74C908	2.00	4026	1.65	4502	.95
74C32	.50	74C909	2.75	4027	.65	4503	.65
74C42	1.75	74C910	9.95	4028	.80	4508	1.95
74C48	2.10	74C911	10.00	4029	.95	4510	.95
74C73	.65	74C912	10.00	4030	.45	4511	.95
74C74	.85	74C914	1.95	4034	2.95	4512	.95
74C76	.80	74C915	2.00	4035	.85	4514	1.25
74C83	1.95	74C918	2.75	4040	.95	4515	2.25
74C85	1.95	74C920	17.95	4041	1.25	4516	1.55
74C86	.95	74C921	15.95	4042	.75	4518	1.25
74C89	4.50	74C922	5.95	4043	.85	4519	1.25
74C90	1.75	74C923	5.95	4044	.85	4520	1.25
74C93	1.75	74C925	6.75	4046	.95	4522	1.25
74C95	1.75	74C926	7.95	4047	.95	4526	1.25
74C107	1.00	74C927	7.95	4049	.55	4527	1.95
74C150	5.75	74C928	7.95	4050	.55	4528	1.25
74C151	2.25	74C929	19.95	4051	.95	4531	.95
74C154	3.25	74C930	19.95	4053	.95	4532	1.95
74C157	1.75	4000	.35	4060	1.45	4538	1.95
74C160	2.00	4001	.35	4066	.75	4539	1.95
74C161	2.00	4002	.25	4068	.40	4543	2.70
74C162	2.00	4006	.95	4069	.35	4555	.95
76C163	2.00	4007	.29	4070	.35	4556	.95
74C164	2.00	4008	.95	4071	.30	4581	1.95
74C165	2.00	4009	.45	4072	.30	4582	1.95
74C173	2.00	4010	.45	4073	.30	4584	.95
74C174	2.25	4011	.35	4075	.30	4585	.95
74C175	2.25	4012	.25	4076	.95	4702	12.95
74C192	2.25	4013	.45	4078	.30	4724	1.50
74C193	2.25	4014	.95	4081	.30	80C07	.95
74C195	2.25	4015	.95	4082	.30	80C95	.85
74C200	5.75	4016	.45	4085	.95	80C96	.95
74C221	2.25	4017	1.15	4086	.95	80C97	.95
74C373	2.75	4018	.95	4093	.95	80C98	1.20

HOURS: Mon. - Fri., 9 to 5; Sat., 11 to 3

VISIT OUR RETAIL STORE!

JDR MICRODEVICES, INC.
1224 So. Bascom Ave.
San Jose, CA 95128
800-538-5000 • 800-662-6279 (CA)
(408) 995-5430 • Telex 171-110

TERMS: For shipping include $2.00 for UPS ground, $3.00 for UPS Blue Label air. $10.00 minimum order. Bay Area residents add 6½% sales tax. California residents add 6% sales tax. We reserve the right to limit quantities and substitute manufacturer. Prices subject to change without notice. Send SASE for complete list.

2716 EPROMS 450NS (5V) 8/4.95 ea.

ALL MERCHANDISE 100% GUARANTEED! **CALL US FOR VOLUME QUOTES**

8000

8035	16.95
8039	19.95
8080A	3.95
8085	12.95
8085A-2	16.95
8086	99.95
8088	39.95
8155	11.95
8156	11.95
8185	29.95
8185-2	39.95
8741	39.95
8748	29.95
8755	44.95

8200

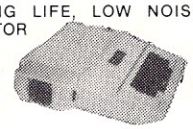
8202	45.00
8205	3.50
8212	1.85
8214	3.85
8216	1.80
8224	2.50
8226	1.80
8228	4.90
8237	19.95
8238	4.95
8239	4.85
8243	4.45
8250	14.95
8251	4.75
8253	9.25
8253-5	9.85
8255	4.75
8255-5	5.25
8257	8.75
8259	6.90
8272	39.95
8275	29.95
8279	9.50
8279-5	10.50
8282	6.65
8283	6.65
8284	5.70
8286	6.65
8287	6.50
8288	25.00
8289	49.95

TV CIRCUITS

MC1330	1.89
MC1350	1.29
MC1358	1.79
LM380	1.29
LM386	1.50
LM565	.99
LM741	.29
LM1310	2.90
LM1800	2.99
LM1889	2.49

APPLE* FAN $69.00

- EXTRA PLUG-IN CARDS CAN CAUSE YOUR APPLE TO OVERHEAT
- ULTRA-QUIET APPLE FAN DRAWS COOL AIR THROUGH YOUR COMPUTER
- ELIMINATES DOWN TIME
- SAVES REPAIR CHARGES
- INCREASES RELIABILITY
- CLIPS ON — NO HOLES OR SCREWS
- COLOR MATCHES APPLE
- LONG LIFE, LOW NOISE MOTOR



*APPLE IS A TRADEMARK OF APPLE COMPUTER INC.

IC SOCKETS

	1-99	100
8 pin ST	.13	.11
14 pin ST	.15	.12
16 pin ST	.17	.13
18 pin ST	.20	.18
20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39

ST = SOLDERTAIL

8 pin WW	.59	.49
14 pin WW	.69	.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
40 pin WW	1.99	1.80

WW = WIREWRAP

CONNECTORS

RS232 MALE	3.25
RS232 FEMALE	3.75
RS232 HOOD	1.25
S-100 ST	3.95
S-100 WW	4.95

DIP SWITCHES

4 POSITION	.85
5 POSITION	.90
6 POSITION	.90
7 POSITION	.95
8 POSITION	.95

6800

6800	5.70
6802	10.95
6808	9.95
6809	24.95
6809E	29.95
6810	4.60
6820	4.95
6821	4.95
6828	14.95
6834	16.95
6840	14.95
6843	42.95
6844	44.95
6845	16.95
6847	15.95
6850	4.75
6852	5.75
6860	10.95
6862	11.95
6875	6.95
6880	2.95
68B00	10.95
68B21	12.95
68B50	12.95

EPROM ERASERS

PE-14	78.50
PE-14T (with timer)	108.50
PE-24T (with timer)	154.50

ALL ARE HIGH QUALITY UNITS ENCLOSED IN A BLACK ANODIZED ALUMINUM ENCLOSURE.

800-538-5000
800-662-6279
(CALIFORNIA RESIDENTS)

CALL JDR BEFORE YOU BUY!
WE WILL BEAT ANY COMPETITORS' PRICES

TRANSISTORS

PN2222	10/1.00	100/ 8.99
2N2222	.25	50/10.99
2N2907	.25	50/10.99
2N3055	.79	10/ 6.99
2N3904	10/1.00	100/ 8.99
2N3906	10/1.00	100/ 8.99
1N4148 (1N914)		25/ 1.00
1N4004		10/ 1.00

LEDS

Jumbo Red	10/1.00
Jumbo Green	6/1.00
Jumbo Yellow	6/1.00
5082-7760 .43'CC	.79
MAN74 .3'CC	.99
MAN72 .3'CA	.99

VOLTAGE REG's

7805T	.79	7905T	.89
7808T	.99	7912T	.89
7812T	.79	7915T	1.19
7815T	.99	7924T	1.19
7824T	.99		
7805K	1.39	7905K	1.49
7812K	1.39	7912K	1.49
7815K	1.39	79LO5	.79
78LO5	.69	79L12	.79
78L12	.69	79L15	.79
78L15	.69		
		LM317K	3.95
LM309K	1.49	LM323K	4.95
LM317T	1.95	LM337K	3.95

T = TO-220 K = TO-3 L = TO-92

LINEAR

LM301V	.34
LM308V	.98
LM309K	1.49
LM311	.64
LM317T	1.95
LM317K	3.95
LM318	1.49
LM323K	4.95
LM324	.59
LM337K	3.95
LM339	.99
LM377	2.29
LM380	1.29
LM386V	1.50
LM555V	.39
LM556	.69
LM565	.99
LM566V	1.49
LM567V	1.29
LM723	.49
LM733	.98
LM741V	.29
LM747	.79
LM748V	.59
LM1310	2.90
MC1330V	1.89
MC1350V	1.29
MC1358	1.79
LM1414	1.59
LM1458V	.69
LM1488	.99
LM1489	.99
LM1800	2.99
LM1889	2.49
LM3900	.59
LM3909V	.98
LM3914	3.95
LM3915	3.95
LM3916	3.95
75451V	.39
75452V	.39
75453V	.39

74S00 SERIES

74S00	.44	74S74	.69	74S163	3.75	74S257	1.39
74S02	.48	74S85	2.39	74S168	4.65	74S258	1.49
74S03	.48	74S86	1.44	74S169	5.44	74S260	1.83
74S04	.79	74S112	1.59	74S174	1.09	74S274	19.95
74S05	.79	74S113	1.98	74S175	1.09	74S275	19.95
74S08	.48	74S114	1.50	74S181	4.47	74S280	2.90
74S09	.98	74S124	2.77	74S182	2.95	74S287	4.75
74S10	.69	74S132	1.24	74S188	3.95	74S288	4.45
74S11	.88	74S133	.98	74S189	14.95	74S289	6.98
74S15	.70	74S134	.69	74S194	2.95	74S301	6.95
74S20	.68	74S135	1.48	74S195	1.89	74S373	3.45
74S22	.98	74S138	1.08	74S196	4.90	74S374	3.45
74S30	.48	74S139	1.25	74S197	4.25	74S381	7.95
74S32	.98	74S140	1.45	74S201	14.95	74S387	5.75
74S37	1.87	74S151	1.19	74S225	8.95	74S412	2.98
74S38	1.68	74S153	1.19	74S240	3.98	74S471	9.95
74S40	.44	74S157	1.19	74S241	3.75	74S472	16.85
74S51	.78	74S158	1.45	74S244	3.98	74S474	17.85
74S64	.79	74S161	2.85	74S251	1.90	74S482	15.60
74S65	1.25	74S162	3.70	74S253	7.45	74S570	7.80
						74S571	7.80

7400 SERIES

7400	.19	7451	.23	74136	.50	74186	18.50
7401	.19	7453	.23	74141	.65	74190	1.15
7402	.19	7454	.23	74142	2.95	74191	1.15
7403	.19	7460	.23	74143	2.95	74192	.79
7404	.19	7470	.35	74144	2.95	74193	.79
7405	.22	7472	.29	74145	.60	74194	.85
7406	.22	7473	.34	74147	1.75	74195	.85
7407	.22	7474	.35	74148	1.20	74196	.79
7408	.24	7475	.49	74150	1.35	74197	.75
7409	.19	7476	.35	74151	.65	74198	1.35
7410	.19	7480	.59	74152	.65	74199	1.35
7411	.25	7481	1.10	74153	.55	74221	1.35
7412	.30	7482	.95	74154	1.40	74246	1.35
7413	.35	7483	.50	74155	.75	74247	1.25
7414	.55	7485	.65	74156	.65	74248	1.85
7416	.25	7486	.35	74157	.55	74249	1.95
7417	.25	7489	4.95	74159	1.65	74251	.75
7420	.19	7490	.35	74160	.85	74259	2.25
7421	.35	7491	.40	74161	.70	74265	1.35
7422	.29	7492	.50	74162	.85	74273	1.95
7423	.29	7493	.49	74163	.85	74276	1.25
7425	.29	7494	.65	74164	.85	74279	.75
7426	.29	7495	.55	74165	.85	74283	2.00
7427	.29	7496	.70	74166	1.00	74284	3.75
7428	.45	7497	2.75	74167	2.95	74285	3.75
7430	.19	74100	1.00	74170	1.65	74290	.95
7432	.29	74107	.30	74172	5.95	74293	.75
7433	.45	74109	.45	74173	.75	74298	.85
7437	.29	74110	.45	74174	.89	74351	2.25
7438	.29	74111	.55	74175	.89	74365	.65
7440	.19	74116	1.55	74176	.89	74366	.65
7442	.49	74120	1.20	74177	.75	74367	.65
7443	.65	74121	.29	74178	1.15	74368	.65
7444	.69	74122	.45	74179	1.75	74376	2.20
7445	.69	74123	.55	74180	.75	74390	1.75
7446	.59	74125	.45	74181	2.25	74393	1.35
7447	.69	74126	.45	74182	.75	74425	3.15
7448	.69	74128	.55	74184	2.00	74426	.85
7450	.19	74132	.45	74185	2.00	74490	2.55

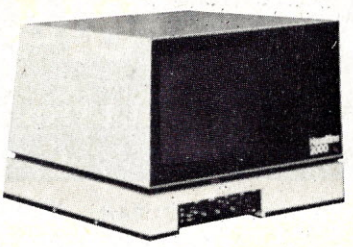
HOURS: Mon. - Fri., 9 to 5; Sat. 11 to 3

VISIT OUR RETAIL STORE!

JDR MICRODEVICES, INC. '84
1224 S. Bascom Ave.
San Jose, CA 95128
800-538-5000 • 800-662-6279 (CA)
(408) 995-5430 • Telex 171-110

TERMS: For shipping include $2.00 for UPS Ground, $3.00 for UPS Blue Label Air. $10.00 minimum order. Bay Area residents add 6½% sales tax. California residents add 6% sales tax. We reserve the right to limit quantities and substitute manufacturer. Prices subject to change without notice. Send SASE for complete list.

SELECTRONICS

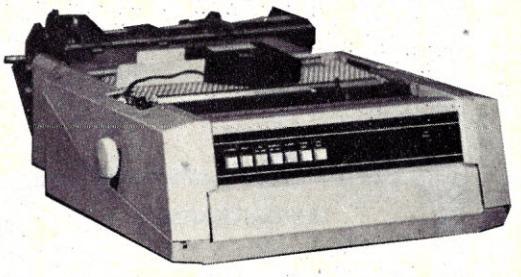


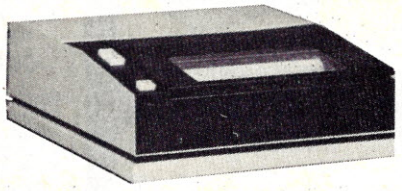
HAZELTINE 2000

* 12" green phos tube
* adjustable baud rate from front
* remote keyboard w/numeric keypad
* insert & delete, chacacter & line mode, and cursor control functions
* external printer & cassette ports
* modem cable w/DB-25 connector
* shipping wt. 65lbs.
* $300.00 f.o.b. our warehouse

GE TN1200 PRINTER

* adjustable tractor feed
* receive only
* parallel interface
* upper & lower case
* 120 cps
* compatible with TRS-80, Apple, etc.
* shipping wt. 85lbs.
* $250.00 f.o.b. our warehouse





TEXAS INSTRUMENT 750 THERMAL PRINTERS

* parallel interface
* upper & lower case
* excellent condition
* shipping wt. 30lbs.
* $90.00 f.o.b. our warehouse

HAZELTINE 1200

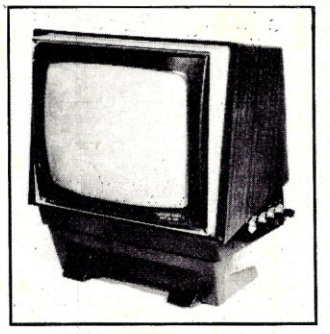
* 24 x 80 characters, baud rate 110-9600
* shipping wt. 47lbs.
* $200.00 f.o.b. our warehouse

HAZELTINE 1000

* 12 x 80 characters, baud rate 110-9600
* shipping wt. 47lbs.
* $150.00 f.o.b. our warehouse

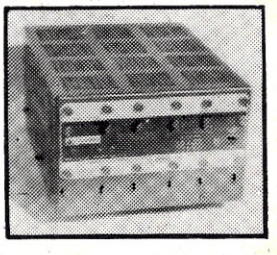
MONITORS

12" black & white monitor. Wide band, will display 80 x 24 char. 10K or 75Ω input impedance, composite video input. Transformer power supply.
Shpt. Wt. 30#
Price: $55 ea.
Used with all computers such as: TRS-80, Apple, and many others.
Complete manual $5.00.



REGULATED DC POWER SUPPLIES
MFGS. LAMBDA & NORTH

VOLTS	– AMPS	WT.	PRICE
5	74	62#	$40.00
5	31	40	35.00
5	16	18	30.00
5	10	18	25.00
5	4	7	20.00
5	13	20	30.00
5	20	30	35.00



MULTIPLE VOLTAGE COMPUTER GRADE NORTH POWER SUPPLY

+ 5VDC @ 25A + 12VDC @ 3A
– 5VDC @ 4A – 12VCD @ 2A
shipping wt. 30lbs.
$35.00 f.o.b. our warehouse

CABLES

5' RG/59U cable with PL259 connector on one end.
Price: $1.00 ea. 6/$5.00

24" RG/59U cable with PL 259 connector on one end, BNC on other end.
Price: $1.00 ea. 6/$5.00

MODEM CABLES

DB-25 male to male 10'–25'
DB-25 male to female 10'–25'
$6.00 ea. 2/$10.00

Anderson-Jacobson 300 baud acoustic coupled modems. $50.00 f.o.b. our warehouse

USACII ENCODED KEYBOARDS

SOLID STATE KEYS CONTOURED TYPEING SURFACE
"N" KEY ROLL-OVER.
COMPLETE 6 PAGES SPEC. MANUAL.
PRICE: $25.00 f.o.b. our warehouse Shpt. 5#

SELECTRONICS

205

1206 S. Napa Street • Philadelphia PA 19146

Penna. resident please add 6% sales tax. **ALL PRICES ARE F.O.B.** our warehouse, Phila. PA. All merchandise accurate as to description to the best of our knowledge. Your purchase money refunded if not satisfied. Min. order $10.00.

Phone: 215-468-7891 215-468-4645

WAMECO

THE COMPLETE PC BOARD HOUSE
EVERYTHING FOR THE S-100 BUSS

TWO NEW BOARDS

CRT-1 VIDEO BOARD

* SIMULATES INTELLIGENT TERMINAL
* SEPARATE & COMPOSITE VIDEO
* LT. PEN INTERFACE
* 4K X 8 DISPLAY RAM
* APC PROM LOCATION
* 4K X 4 ATTRIBUTE RAM
* 2K OR 4K OF PROGRAM LOCATION
* KEYBOARD INTERFACE
* SOFTWARE PROVIDED FOR 80 X 24, 80 X 16, GRAPHICS, HALF FULL DUPLEX, KEYBOARD

PCBD.....$38.95
KIT.....$259.95
A & T.....$319.95

MEM-4, RAM/ROM 65 X 8

* USES TMN 2016 - TMS 4016 RAMS OR 2716 EPROM IN ANY LOCATION
* EXTENDED ADDRESSING
* EXPANDABLE IN 2K BLOCKS
* HCMOS COMPATABLE FOR ALL SUPPORT
* B1 - DIRECTIONAL BUSSING AVAILABLE ON DI OR DO LINES (SAME MEM-3)
* BANK SELECTABLE USING EXTENDED ADDRESSING ON UPPER PORTION OF MEMORY

PCBD.....$38.95
KIT (LESS RAM).....$99.95
A & T LESS RAM.....$135.95
KIT (W 200 NSEC RAM).....$439.95
A & T (W 200 NSEC RAM).....$469.95

FUTURE PRODUCTS: REAL TIME CLOCK WITH CMOS TIME OF DAY
8 PARALLEL PORT I/O BOARD

DEALER INQUIRIES INVITED, UNIVERSITY DISCOUNTS AVAILABLE
AT YOUR LOCAL DEALER

wmc inc.

WAMECO, INC., P. O. BOX 877 • EL GRANADA, CA 94018 • (415) 728-9114

CALIFORNIA COMPUTER SYSTEMS

S100

2032 32K STATIC RAM A & T 200 NSEC	$629.00
2116 16K STATIC RAM A & T 200 NSEC	$329.00
2065 64K DYNAMIC RAM A & T	$548.95
2200 S-100 MAIN FRAM A & T	$379.95
2422 FLOPPY DISC WITH CP/M 2.2	$329.95
2802 6502 PROCESSOR A & T	$282.95
2810A Z80 CPU A & T	$249.95
2710A 4 SERIAL I/O A & T	$291.95
2718A 2 SERIAL, 2 PARALLEL A & T	$305.95
2720A 4 PARALLEL A & T	$214.95
PROTO BOARDS WW	$39.95

APPLE PRODUCTS

7114A 12K ROM/PROM	$68.50
7424A CALENDAR/CLOCK	$106.95
7440A PROGRAMMABLE TIMER	$98.50
7470A A TO D CONVERTER	$105.95
7490A GPIB (IE 488) INTERFACE	$265.95
7710A ASYNC SERIAL	$125.95
7712A SYNC SERIAL	$153.95
7720A PARALLEL STANDARD	$98.95
7720B PARALLEL CENTRONICS	$98.95
7811B ARITHMETIC PROCESSOR W/DISC	$342.95
7811C ARITHMETIC PROCESSOR W ROM	$342.95
7500A WW BOARD	$22.95
7510A SOLDERTAIL BOARD	$23.95

SOFTWARE

2610 CP/M™ MACRO ASSEMBLER ON DISK	$76.95
2620 CP/M™ SYMBOLIC INSTRUCTION DEBUGGER	$64.25
2630 CP/M™ TEXT FORMATER	$64.25
2640 CP/M™ BACKGROUND PRINT UTILITY	$42.95

OTHER CCS PRODUCTS ARE AVAILABLE. CALL FOR PRICE.

SSM MICROCOMPUTER PRODUCTS

S100 PRODUCTS

CBIA 8080 PROCESSOR PCBD	$32.95
KIT $155.95, A & T	$215.95
CB-2 280 PROCESSOR BOARD	
KIT $198.95, A & T	$269.95
VBIC 64 x 16 VIDEO, PCBD	$32.95
KIT $153.95, A & T	$199.95
VB2 64 x 16 VIDEO, PCBD	$32.95
KIT $175.95, A & T	$234.95
VB3 80 CHARACTER VIDEO 4MHZ	
KIT $345.95, A & T	$425.95
UPGRADE RAMS FOR VB-3	$42.00
I04 2 PARALLEL, 2 SERIAL, PCBD	$32.95
KIT $155.95, A & T	$194.95
PB-1 2708, 2716 PROGRAMMER BOARD	
KIT $135.95, A & T	$185.95
MB-10 16K STATIC RAM	
KIT $299.95, A & T	$339.95

APPLE PRODUCTS

A488 IEEE 488 INTERFACE	$399.95
AIO SERIAL/PARALLEL INTERFACE A & T	$155.95
ASIO SERIAL I/O A & T	$97.95
APIO PARALLEL IO W/O CABLES A & T	$87.95

OTHER SSM PRODUCTS ARE AVAILABLE. CALL FOR PRICES.

MIKOS

MONDAY-FRIDAY, 8:00 TO 12:00, 1:00 TO 5:30
THURSDAYS, 8:00 TO 9:00 P.M.

(415) 728-9121
P.O. BOX 955 • EL GRANADA, CA 94018
PLEASE SEND FOR IC, XISTOR AND COMPUTER PARTS LIST

MAY SPECIAL SALE
ON PREPAID ORDERS
(CHARGE CARDS, C.O.D. OR P.O.'S NOT AVAILABLE)

WAMECO CRT-1 INTRODUCTION (AT LAST)
16 X 80 OR 24 X 80 VIDEO BOARD I/O MAPPED
SIMULATES INTELLIGENT TERMINAL

PCBD.....$36.95, KIT.....$239.95
A & T.....$299.95

wmc inc. **WAMECO INC.**

BOARDS WITH MIKOS PARTS

MEM-3 32K STATIC RAM, PCBD	$36.95
KIT LESS RAM $95.95, A & T	$135.95
CPU-2 Z80 PROCESSOR, PCBD	$32.95
KIT LESS ROM $109.95, A & T	$149.95
EPM-2 16K/32K EPROM, PCBD	$32.95
KIT LESS ROM $65.95, A & T	$99.95
FPB-1 FRONT PANEL, PCBD	$48.50
KIT $144.95, A & T	$184.95
CPU-1 8080 PROCESSOR, PCBD	$29.95
KIT $89.95, A & T	$129.95
QMB-12 13 SLOT MOTHER BOARD, PCBD	$39.95
KIT $95.95, A & T	$135.95

OTHER WAMECO PRODUCTS ARE AVAILABLE. CALL FOR PRICES.

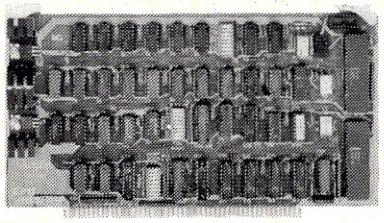
MIKOS PARTS ASSORTMENTS ARE ALL FACTORY MARKED PARTS. KITS INCLUDE ALL PARTS LISTED AS REQUIRED FOR THE COMPLETE KIT LESS PARTS LISTED. ALL SOCKETS INCLUDED.

LARGE SELECTION OF LS TTL AVAILABLE.
PURCHASE $50.00 WORTH OF LS TTL AND GET 10% CREDIT TOWARD ADDITIONAL PURCHASES. PREPAID ORDERS ONLY.

VISA or MASTERCHARGE. Send account number, interbank number, expiration date and sign your order. Approx. postage will be added. Orders with check or money order will be sent post paid in U.S. If you are not a regular customer, please use charge, cashier's check or postal money order. Otherwise there will be a two-week delay for checks to clear. Calif. residents add 6% tax. Money back 30-day guarantee. We cannot accept returned IC's that have been soldered to. Prices subject to change without notice. **$20 minimum order. $2.00 service charge on orders less than $20.00.**

PRIORITY ONE ELECTRONICS

S-100 CPU



CPU-Z - GODBOUT WOW!

2/4 MHZ Z80 CPU 24 Bit Addressing

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
KEGBT 160A	A & T	$295.00	$199.00
KEGBT 160C	CSC 3-6 MHZ	$395.00	$375.00

DUAL PROCESSOR 8085-8088 - COMPUPRO

6 or 8 MZ Provides true 16 Bit Power with a standard 8 bit S-100 bus.

KEGBT 1612A	A & T	6 MHZ.	$425.00	$399.00
KEGBT 1612C	CSC	6/8 MHZ	$525.00	$498.00

816 DUAL PROCESSOR 8086 - 8087 COMPUPRO

KEGBT186A	A&T 8086 Only	$695.00	$625.00
KEGBT186C	CSC 8086 Only	$850.00	$765.00
KEGBT8087	8087 Chip		CALL

MPM 816™ — COMPUPRO

Runs CPM 80™, CPM 86™, And MPM86™ AT THE SAME TIME! 8 AND/OR 16 BIT TOGETHER! WOW!

KEGBTMPM816	Software	$995.00

See Compupro AD in May **BYTE** *for details*

SOLID STATE DISK DRIVE, 3500% FASTER!

Not Really, But the Next Best Thing For Compupro 8085/88 Users. Call for Details on M-Drive.

KEGBT MD !28K	$1,550.00
KEGBT MD 256K	$3,000.00

2810 Z80 CPU-CA. COMP. SYST.

2/4 MHZ Z80A CPU with RS232C Serial I/O Port complete with Monitor PROM for 2422 Disk Controller

KECCS 2810A	A & T	$350.00	$280.00

CB2 Z80 CPU - S.S.M.

2/4 MHZ will accept 2716, or 2732, or RAM

KESSMCB2K	Kit	$260.00
KESSMCB2A	A & T	$344.00 — $310.00
KESSMZ80M	SSMZ80 Monitor	$89.00

S-100 I/O BOARDS

SYSTEM SUPPORT 1 - GODBOUT

Serial port (software prog baud), 4K EPROM OR RAM provision, 15 levels of interrupt, real time clock, optional math processor

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
KEGBT162A	Assembled & Tested	$399.00	$360.00
KEGBT162C	CSC	$495.00	$460.00
KEGBT8231	Math Chip		$195.00
KEGBT8232	Math Chip		$195.00
KEGBT162AM1	A&T with 8231 Math Chip		$555.00
KEGBT162CM1	CSC with 8231 Math Chip		$655.00
KEGBT162AM2	A&T with 8232 Math Chip		$555.00
KEGBT162CM2	CSC with 8232 Math Chip		$655.00

MPX CHANNEL BOARD - COMPUPRO

I/O Multiplexer, using 8085A-2 CPU on board

	With 4K RAM		
KEGBT166A4	A & T	$495.00	$445.00
KEGBT166C4	CSC	$595.00	$535.00
	With 16K RAM		
KEGBT166A16	A & T	$649.00	$585.00
KEGBT166C16	CSC	$749.00	$675.00

INTERFACER I - COMPUPRO

Two Serial I/O

KEGBT133A	A & T	$249.00	$219.00
KEGBT133C	CSC	$324.00	$298.00

INTERFACER II - COMPUPRO

Three parallel, one serial I/O board

KEGBT150A	A & T	$249.00	$219.00
KEGBT150C	CSC	$324.00	$289.00

INTERFACER III - COMPUPRO

Eight channel multi-use serial I/O board

KEGBT1748A	A & T	$699.00	$629.00
KEGBT1748C	CSC 200 hr. 8 Port	$849.00	$750.00
KEGBT1745A	A & T	$599.00	$559.00
KEGBT1745C	CSC 200 hr. 5 Port	$699.00	$629.00

MULTI I/O - MORROW DESIGNS

Three Serial, Two parallel

KEMDSMB3200	A & T	$359.00	$329.00

SWITCHBOARD - MORROW DESIGNS

Two serial I/O, four parallel I/O, one status port, one strobe port

KEMDSSB2411		$299.00	$269.00

I/O4 - SSM

Two serial I/O, two parallel I/O

KESSMI04K	Kit		$210.00
KESSMI04A	A & T	$290.00	$260.00

I/O 5 - SSM

2 Serial, 3 Parallel including 1 Centronics

KESSMI051	A & T	$329.00	$309.00

I/O 8 - SSM

8 Port Serial I/O with Timer

KESSMI08A	A & T	$550.00	$495.00

2710 4 PORT SERIAL - CCS

4 Full handshaking RS232 ports and optional 2K ROM

KECCS271001	A & T	$360.00	$310.00

2719 2 SERIAL & 2 PARALLEL - CCS

2 RS232 C ports, 2 8 bit parallel ports, & optional 2K ROM

KECCS271901	A & T	$360.00	$325.00

2720 4 PORT PARALLEL - CCS

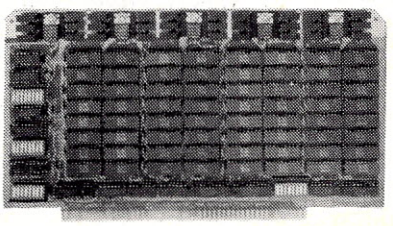
4 8 bit parallel ports and optional 2K ROM

KECCS272001	A & T	$250.00	$225.00

S-100 10 MHZ STATIC RAM

NEW LOW PRICES!

RAM 20 - 32K
SALE $299.00



32K STATIC RAM - COMPUPRO

RAM 20 10 MHZ, 4K byte block disable, bank select or 24 bit addressing available 8, 16, 24 or 32K

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
KEGBT164AA8	8K A&T	$210.00	$190.00
KEGBT164AC8	8K CSC	$280.00	$260.00
KEGBT164AA16	16K A&T	$285.00	$260.00
KEGBT164AC16	16K CSC	$355.00	$325.00
KEGBT164AA24	24K A&T	$355.00	$325.00
KEGBT164AC24	24K CSC	$425.00	$385.00
KEGBT164AA32	32K A&T	$425.00	$299.00
KEGBT164AC32	32K CSC	$495.00	$450.00

CMOS STATIC RAM

For a complete analysis of the advantages of CMOS memory, see the "Product Description" on page 416 of the January Issue of **BYTE**.

64K CMOS STATIC RAM - COMPUPRO

RAM 17, 10 MHZ, 2 Watt, DMA Compatable 24 Bit Addressing

KEGBT175A64	64K A&T	$599.00	$550.00
KEGBT175C64	64K CSC 200hr.	$699.00	$650.00

NEW! 32K x 16 BIT CMOS STATIC RAM - COMPUPRO

8 and/or 16 Bit

816 RAM 16 10 MHZ, 32K x 16 or 64K x 8 IEEE/696 16 BIT 2 Watt, 24 Bit Addressing

KEGBT180A	64K A&T	$650.00	$599.00
KEGBT180C	64K CSC	$750.00	$699.00

NEW! 128K NMOS STATIC RAM - COMPUPRO

RAM 21 10MHZ 128K X 8 OR 64K x 16 IEEE/696 8 or 16 Bit 1.2 Amps 24 Bit Addressing

KEGBT167A	128K A&T	$1695.00	$1610.00
KEGBT167C	128K CSC	$1895.00	$1795.00

S-100 PROM

PBI PROM PROGRAMMER - SSM

Programs 2708 or 2716's, operates as a 4K/8K EPROM BOARD AS WELL.

KESSMPB1K	Kit		$179.00
KESSMPB1A	A & T	$265.00	$220.00

ECONOROM 2708 - COMPUPRO

16K x 8 EPROM Board using 2708, Power on jump to any 256 byte

KEGBT125A	A & T	$135.00	$120.00
KEGBT125C	CSC	$195.00	$175.00

MB8A - SSM

1K/16K 2708 EPROM board, disable in 1K increments

KESSMMB8AK	Kit		$114.00
KESSMMB8AA	A & T	$179.00	$159.00

S-100 VIDEO BOARDS

SPECTRUM - COMPUPRO

Color Graphics board with Parallel I/O

KEGBT144A	A & T	$399.00	$349.00
KEGBT144C	CSC	$449.00	$399.00
KEGBT2D	Sublogic Universal Graphics Interpreter Software		$35.00

VB - 3 S.S.M.

80 x 25 or 50 character video display Memory Mapped, Parallel Keyboard port

KESSMVB3K24	80 x 24 Kit		$425.00
KESSMVB3A24	80 x 24 A&T	$499.00	$440.00
KESSMVB3UP	80 x 50 Line Upgrade		$ 39.00

VB2-S.S.M.

I/O Mapped Video Board, with Parallel Keyboard port 64 x 16

KESSMVB2K	Kit		$199.00
KESSMVB2A	A & T	$269.00	$229.00

VBBB - S.S.M

Memory Mapped Video Board 64 x 16 character display or 64 x 16 graphics display

KESSMVB1K	Kit		$179.00
KESSMVB1A	A & T	$242.00	$220.00

S-100 CLOCK CALENDAR

KEQTCCCSA	Assembled & Tested	$150.00

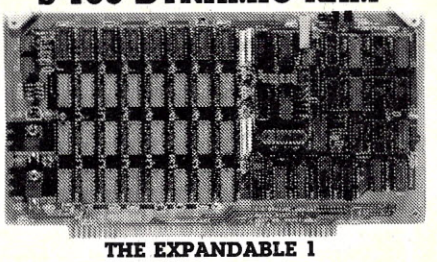
As seen in March Kilobaud Magazine

S-100 MOTHERBOARDS - COMPUPRO

Active termination, 6-12-20 slot

KEGBT153A	A&T 6 slot, 2 lbs	$140.00	$126.00
KEGBT153C	CSC 6 slot, 2 lbs.	$190.00	$175.00
KEGBT154A	A&T 12 slot, 3 lbs.	$175.00	$155.00
KEGBT154C	CSC 12 slot, 3 lbs.	$240.00	$220.00
KEGBT155A	A&T 20 slot, 4 lbs.	$265.00	$235.00
KEGTB155C	CSC 20 slot, 4 lbs.	$340.00	$310.00

S-100 DYNAMIC RAM



THE EXPANDABLE 1
PRIORITY 1 ELECTRONICS

THE EXPANDABLE 1™ 64K Dynamic Ram board provides your S-100 system with 64K of reliable, high-speed dynamic RAM. Compatable with most of the major S-100 systems on the market, including those with front panels, it supports DMA operations and requires no Wait states with current microprocessors.

- *User expandable from 16 to 64K*
- *Supports DMA*
- *Designed to IEEE proposed S-100 bus standards*
- *2 or 4 MHz operation*
- *Operates with either an 8080 or Z-80 based S-100 system, providing processor-transparent refreshes with both*
- *Supports IMSAI-type front panels*
- *Jumper-selectable Phantom input*
- *Uses Popular 4116 RAMS*
- *All ICs in sockets*
- *Any 16K block can be made bank-independent*
- *Fully buffered address and data lines*
- *Fail-safe refresh circuitry for extended Wait states*
- *Board configuration with reliable, easy-to-configure Berg jumpers*

KEPRIEXP116	16K Assembled & Tested	$299.00
KEPRIEXP132	32K Assembled & Tested	$339.00
KEPRIEXP148	48K Assembled & Tested	$379.00
KEPRIEXP164	64K Assembled & Tested	$409.00

S-100 DISK CONTROLLERS

2422A - CA. COMP. SYST.

I/O Mapped, controls 8", single or double density A&T with CPM 2.2 8" S.D.

		LIST PRICE	OUR PRICE
KECCS2422A		$475.00	$375.00

DISK JOCKEY 2D - MORROW

Memory Mapped, controls 8", single or double density, serial I/O

KEMDIDJ2208	A&T with CP/M 2.2	$399.00	$375.00

S-100 DISK SUBSYSTEMS

DJ2B DISCUS SINGLE SIDED MORROW

8" DBL Density drives with cabinet, power supply controller, with CP/M 2.2 and Microsoft Basic

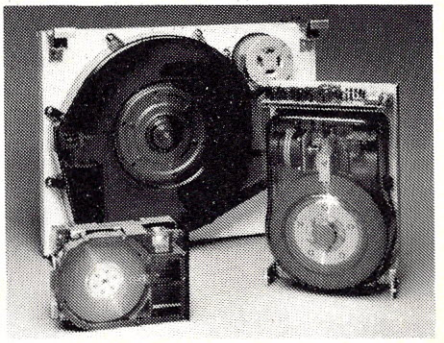
KEMDSF1218	Single Drive System	$1095.00	$950.00
KEMDSF1228	Dual Drive System	$1875.00	$1598.00

DJ2B DISCUS DOUBLE SIDED - MORROW

8" DBL Density/sided drives with cabinet Power supply controller, with CP/M 2.2 and Microsoft Basic

KEMDSF2218	Single Drive System	$1395.00	$1250.00
KEMDSF2228	Dual Drive System	$2495.00	$2050.00

S-100 HARD DISK - MORROW

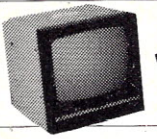


5.25" 5MB, 8" 10 & 20MB, 14" 26MB formatted hard disk complete with cabinet, P.S., Controller, CP/M 2.2 and Microsoft MBASIC 80

		LIST PRICE	SALE PRICE
KEMDSDMAM5	5 MB	$2495.00	$1995.00
KEMDSM10S	10 MB	$3695.00	$2950.00
KEMDSM20S	20 MB	$4795.00	$3825.00
KEMDSM26S	26 MB	$4495.00	$3495.00

WOW!

BEST PRICE!



NEW! GREEN 80 x 24

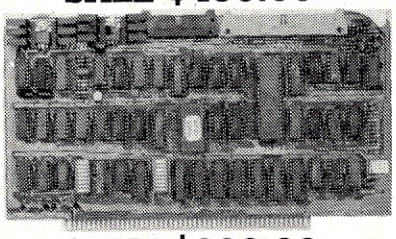
OUTPERFORMS MONITORS OF TWICE THE PRICE!

USI has the competition buckling at their knees! You can have a professional performing Video Monitor for a **fraction of the cost!** *The USI EV2131N is a 12" Green, high resolution data display compatable with 80 x 24 computer formats*

KEUSIEV2131N	24 lbs.	$149.00

PRIORITY ONE ELECTRONICS

COMPUPRO DMA DISK 1 WITH FREE CP/M 2.2 SALE $450.00



SAVE $220.00

Priority 1 Electronics is pleased to offer the COMPUPRO DISK 1 High Performance Disk Controller at our regular low price with CP/M 2.2 and BIOS at no additional cost. That's a savings of $220.00 of the manufacturer's list price.

- *Third generation INTEL 8272/NEC 765A LSI floppy disk controller.*
- *High speed cycle stealing DMA interface for processor independent data transfer between system memory and flexible disk.*
- *Handles up to four 8 or 5.25 inch floppy disk drives*
- *Single or double density/single or double sided capability.*
- *Supports IBM 3740 soft sectored formats.*
- *24 bit DMA addressing with data transfer across 64K boundaries for data transfer throughout the 16Mbyte memory map.*

PART NO.	DESCRIPTION	LIST PRICE	OUR PRICE
KEPDB171ACPM	A&T w/CP/M 2.2 & BIOS	$670.00	$450.00
KEGBT171C	CSC	$595.00	$555.00
KEGBTCPM80*	CP/M 2.2 for Z80/8085 with manuals & BIOS 8" S/D disk		$175.00
KEGBTOASBS	Oasis 8 bit single user 8" S/D disk		$500.00
KEGBTOAS8M	Oasis 8 bit multiuser, 8" S/D disk		$850.00

S-100 SYSTEMS

SUPERSIXTEEN — COMPUPRO

HERE IS WHAT EACH PACKAGE INCLUDES:

KEGBT1612A *6 MHz 8085/8088 Dual Processor Board*
KEGBT171A *High Speed DMA Disk Controller*
KEGBT162A *System Support 1 Multi-Function Board*
KEGBT133A *Interfacer 1 Dual Serial I/O*
KE128K 10MHz *Low Power Static Ram*
KEGBTCP/M 86 *16 Bit Operating System Ready to Load & Go*
Cables and Documentation *Three interfacer cables one disk I/O cable, complete documentator for all hardware, and manuals for both CP/M operating systems.*
Compu Pro's *famous* **1 Year** *limited warranty.*

Now to the best part of all. If purchased separately, these quality components would list for $4,344.00. **BUT SuperSixteen's low package price is an amazing $3,495.00. You save $849.00!** *(For boards qualified under the Certified System Component high-reliability program - with extended 2 year warranty, 200 hour burn-in and 6/8 MHz processors - add $600.00 to the package price.* Sh. Wt. 15 lbs.

KEPDBGBTSJ	SuperSixteen A&T	$3495.00
KEPDBGBTSK	SuperSixteen CSC	$4095.00

PRINTERS

BEST PRICE!

MICROLINE — OKIDATA
WITH FRICTION AND TRACTOR FEED

- *BI-DIRECTIONAL - 120 CPS*
- *9x9 Matrix (Alphanumeric)*
- *6x9 or 12 Matrix for Graphics*
- *5,8.3, 10,16 Charactrs p/Inch*
- *6 or 8 Lines per Inch*
- *80 CPL@10 CPI for 82A*
- *132 CPL@10 CPI for 83A*
- *Parallel and Serial I/O*
- *100 Thru 1200 Baud*
- *Self Test*
- *Out of Paper Switch*
- *Friction or Tractor Feed*
- *3" to 14" Top of Form (Switch Selectable)*
- *10 Different Character Sets*

PART NO.	DESCRIPTION	LIST PRICE	SALE PRICE
KEOKIDAT82AT(26 lbs)	80 CPL @ 10 CPI	$ 799.00	$539.00
KEOKIDAT83AT (37 lbs)	132 CPL @ 10 CPI	$1195.00	$750.00
KEOKISER2KBF	9600 baud with 2K Serial Buffer upgrade with X-on Y-off		$159.00
KEOKIGRAPH	High Resolution Graphics Prom		$99.00

CALL FOR THE NEW MICROLINE 84

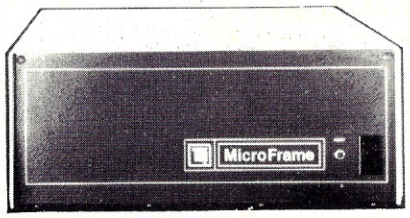
MX80 — EPSON
NEED WE SAY MORE?

KEEPNMX80	Tractor Feed 17 lbs	$645.00	$450.00
KEEPNMX100	132 Col. Tractor Feed 24 lbs		$725.00

PRINTER INTERFACES - MICROBYTE

RS232 Serial Conversion for MX80
KEMBSSEI1 *A & T* $55.00
Apple Centronics 8 bit parallel interface for Centronics, Epson & OKIDATA printers
KEMBSAEI1 *A & T* $55.00
KEMBSAEC1 *Cable for above* $14.95
Printer interfaces & cables sold only with printer purchase

S-100 MAINFRAMES



S-100 MICROFRAME - TEI

110V 60HZ CVT Mainframes, the best money can buy!
12 Slot ±8V 17A±16V @ 2A
22 Slot ±8V @ 30A± 16V @ 4A

PART NO.		LIST PRICE	OUR PRICE 1-9	10-24
KETEIMCS 112	12 Slot Desk	$685.00	$615.00	$570.00
KETEIMCS 122	22 Slot Desk	$825.00	$760.00	$705.00
KETEIRM 12	12 Slot Rackmount	$725.00	$720.00	$619.00
KETEIRM 22	22 Slot Rackmount	$875.00	$850.00	$750.00

Shipping Weight: On 12 Slot Mainframe 45 lbs. On 22 Slot Mainframes 55 lbs.

TEI S-100 FRAMES
3 - 5" DISK CUTOUTS

±8V @ 17±16V @ 1.2A, Internal Cables

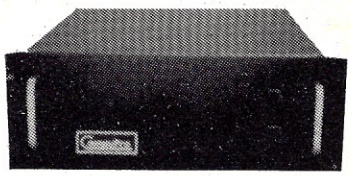
			1-9	10-24
KETEITF12	12 Slot desk	$675.00	$625.00	$580.00
KETEIRF12	12 Slot Rackmount	$795.00	$715.00	$665.00

Shipping Weight: On 12 Slot Desk 40 lbs. On 12 Slot Rackmount 45 lbs.

DUAL 8" DISK DRIVE CHASSIS - TEI

For Shugart 800/801R or 850/851R with internal power cables provided
+24V @ 1.5A+5V @ 1.0A - 5V @ .25A

			1-9	10-24
KETEBCFDO	Desk Top	$535.00	$485.00	$455.00
KETEIRFDO	Rack Mount	$720.00	$670.00	$630.00



S-100 MAINFRAME - COMPUPRO

110V 60HZ CVT Mainframe uses famous 20 slot COMPUPRO Motherboard. 55 lbs.

KEGBTENC20RM	20 Slot Rack Mount	$895.00	$825.00
KEGBTENC20DK	20 Slot Desk Top	$825.00	$760.00

S-100 MAINFRAME - CCS

12-slot motherboard with removable termination card

KECCS220001	Office Cream	35 lbs	$575.00	$535.00
KECCS220002	Blue	35 lbs	$575.00	$535.00

SOFTWARE - MICROPRO

All software is supplied on 8" Single Density IBM 3740 CP/M Compatable Diskettes

WORDSTAR
Screen-Oriented, integrated word processing system specifically designed for non-technical personnel
KEMPRWRDSTA1 $495.00 **$300.00**

MAIL MERGE WORD STAR OPTION
Powerful file merging tool
KEMPRMLMRGA1 *(Requires Word Star 2.1 or later)* $250.00 **$100.00**

SPELLSTAR WORD STAR OPTION
One Step "Proofreader" with compressed 20,000 word dictionary and user-created supplemental dictionaries
KEMPRSPLSTA1 *(Requires Word Star 3.0 or later)* $250.00 **$150.00**

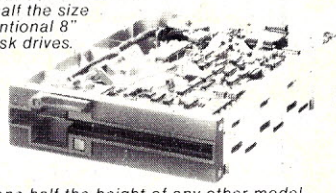
SUPERSORT
Sophisticated program that will select and re-arrange variable length information from data files
KEMPRSPRSRA1 $250.00 **$150.00**

CALC STAR
Sophisticated, easy-to-use, electronic spread sheet and financial planner
KEMPRCLCSTA1 $295.00 **$200.00**

DATA STAR
Office-Oriented Data Entry, retrival, and updating system
KEMPRDATSTA1 $350.00 **$200.00**

FLOPPY DISC DRIVES

Tandon TM-800 Thinline is exactly half the size of conventional 8" floppy disk drives.



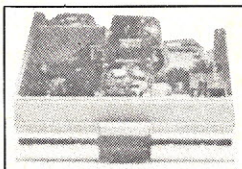
Exactly one-half the height of any other model.
Propietary, high-resolution, read-write heads patented by Tandon
D.C. only operation - no A.C. required
Industry standard interface.
Three millisecond track-to-track access time 9 lbs.

KETNDTM8481	Single Sided	$425.00	2 or more	$395.00
KETNDTM8482	Double Sided	$575.00	2 or more	$550.00
KETNDTM8M	Manual - not included with drive			$ 10.00

80IR - SHUGART

Single sided double density most popular 8" drive
KESHU80IR *$425.00 ea or 2 or more (16 lbs) for* **$395.00** *ea.*
KESHUSA80IRM *Manual for 80IR drives* **$ 10.00**

DT-8 - QUME



DT-8 - QUME
2 OR MORE $499.00

Data track 8 double sided, double density 8"
KEQMEDT8WH *Sh. Wt. 16 lbs* **$550.00 ea.**

2 or more $525.00 each

KEQMEDT8M *Manual for DT-8* **$ 10.00**

5¼" DRIVES - TANDON

KETNDTM1001 *Single Sided, 250KB (5 lbs)* **$249.00* ea.**
2 or More $220.00
KETNDTM1002 *Double Sided, 500KB* **$325.00 ea.**
2 or More $299.00
KETNDTM1003 *Single Sided, 500KB* **$325.00 ea.**
2 or More $299.00
KETNDTM1004 *Double Sided, 1000KB* **$449.00 ea.**
2 or More $420.00
KETNDTM5M *Manual, not included with drive* **$ 10.00**

**As used in the IBM P.C.*

DISK CABINETS

V-100 - VISTA

- *Desk or rack mountable* - *Internal power and data cables*
- *Drives pull out for easy service and maintenance*

KEVISV100 *Disk Drive Cabinet (43 lbs)* $495.00 **$449.00**

SINGLE 8" - Q.T.

Single 8" cabinet with power supply
KEQTCDDC8 *(22 lbs)* $249.00 **$225.00**

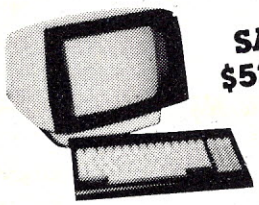
DUAL 8" - Q.T.

Dual 8" cabinet with power supply
KEQTCDDC88 *(24)* $395.00 **$349.00**

5" CABINETS - VISTA

KEVIS 9801 *Single 5" with P.S.* **$75.00**
KEVIS 9802 *Dual 5" with P.S.* **$95.00**

TERMINALS



SALE! $525.00

VIEWPOINT — ADDS

Detachable keyboard, RS232 interface and auxiliary port, 80 x 24 display, tiltable screen **SALE**
KEADDVWPR *Shipping Weight 30 lbs $699.00* **$525.00**

VT200 — VISUAL TECHNOLOGY

THE MOST RELIABLE TERMINAL WE'VE EVER USED!
Detachable keyboard, RS232C or 20MA interface, 110 to 19200 baud, 12" non glare 80 x 24 display, RS232 Aux. port and composite video out.
KEVSL200 *Shipping Weight 55 lbs.* **$995.00**

✓ 277

master charge VISA **PRIORITY ONE ELECTRONICS©** MEMBER MIA NEDA

9161K DEERING AVE ● CHATSWORTH, CA 91311

ORDER TOLL FREE (800) 423-5922 CA, AK, HI CALL (213) 709-5464

Terms U.S. VISA, MC, BAC, Check, Money Order, U.S. Funds Only. CA residents add 6% Sales Tax. MINIMUM PREPAID ORDER $15.00. Include MINIMUM SHIPPING & HANDLING of $2.50 for the first 3 lbs. plus 25¢ for each additional pound. Orders over 50 lbs. sent freight collect. Just in case, please include your phone number. Prices subject to change without notice. We will do our best to maintain prices through May, 1982. Credit Card orders will be charged appropriate freight. See November **BYTE** for 60 page Catalog or send $1.00 for your copy today. Sale prices are for prepaid orders only.

LOOK IN MAIL FOR CATALOG!

FULL LINE ALL PARTS & COMPUTER PRODUCTS

Quest ELECTRONICS ✓44

P.O. Box 4430S
Santa Clara, CA 95054
Will calls: 2322 Walsh Ave.
(408) 988-1640

Same day shipment. First line parts only. Factory tested. Guaranteed money back. Quality IC's and other components at factory prices.

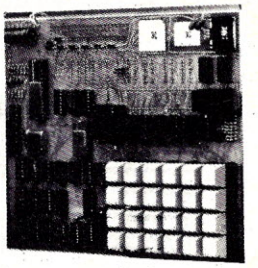
INTEGRATED CIRCUITS

Phone orders only (800) 538-8196

7400TTL		LM317T	1.65	CD4017	1.05	8126	1.69	**UART/FIFO**		DE9S	1.95
7400N	.19	LM317K	3.75	CD4018	.94	8128	1.95	AY5-1013	3.95	DA15P	2.10
7402N	.19	LM318	1.49	CD4019	.45	8197	.99	AY5-1014	6.95	DA15S	3.10
7404N	.22	LM320K-5	1.35	CD4020	.95	8198	.99	3341	6.95	Complete Set	9.50
7409N	.19	LM320K-12	1.35	CD4021	.95	**MOS/MEMORY RAM**		**PROM**		**Stopwatch Kit**	**26.95**
7410N	.19	LM320K-15	1.35	CD4022	1.10	2101-1	1.95	1702A	4.50	**Auto Clock Kit**	**17.95**
7414N	.55	LM320T-5	.85	CD4023	.28	2102-1	.85	2532	17.50	**Digital Clock Kit**	**19.75**
7420N	.19	LM320T-8	.85	CD4024	.75	2102AL-4	1.25	2708	2.95	**RESISTORS ¼ watt 5%**	
7430N	.19	LM320T-12	.85	CD4025	.23	2102AN-2L	1.65	2716TI	8.50	10 per type	.05
7442N	.49	LM320T-15	.85	CD4026	1.65	2104A-4	4.95	2716 5 Volt	5.50	100 per type	.015
7445N	.69	LM323K-5	4.95	CD4027	.65	2107B-4	3.75	8-2716 5 Volt	39.00	1000 per type	.012
7447N	.69	LM324N	.59	CD4028	.80	2111-1	2.99	2732	16.50	5000 per type	.0085
7448N	.69	LM339N	.99	CD4029	.95	2112-2	2.99	2758	7.49	350 piece pack,	
7474N	.35	LM340K-5	1.35	CD4030	.45	2114	2.24	8741A	39.95	5 per type	8.95
7475N	.49	LM340K-8	1.35	CD4035	.85	2114L-300ns	2.50	8748	39.95		
7485N	.65	LM340K-12	1.35	CD4040	.95	2114L 450ns	2.37	8748-8	34.95	⅛ watt 5% per type	.05
7489N	1.70	LM340K-15	1.35	CD4042	.75	4116 200ns.	2.50	8755A	49.95	**DIP SWITCHES**	
7490N	.35	LM340K-24	1.35	CD4043	.85	8 4116 200ns	15.40	N82S23	2.95	4-position	.85
7495N	.55	LM340T-5	.75	CD4044	.85	MM5280	3.00	N82S123	3.95	5-position	.90
74100N	1.00	LM340T-8	.75	CD4046	.95	MM5321	9.95	N82S126	5.75	6-position	.90
74107N	.30	LM340T-12	.75	CD4049	.45	MM5330	5.94	N82S129	4.75	7-position	.95
74123N	.55	LM340T-15	.75	CD4050	.55	PS1011	8.95	N82S131	4.95	8-position	.95
74125N	.45	LM340T-18	.75	CD4051	.95	4200A	11.50	N82S136	8.75		
74145N	.60	LM340T-24	.75	CD4060	1.42	9368	3.50	N82S137	8.75	**KEYBOARDS**	
74150N	1.20	LM350	5.50	CD4066	.71	410D	10.00	DM8577	2.90	56 key ASCII keyboard kit	$74.95
74151N	.65	LM377	2.29	CD4068	.39	416	2.50	8223	3.50	Fully assembled	84.50
74154N	1.25	LM380N	1.00	CD4069	.35	TMM2016	16.95			Enclosure Plastic	19.95
74157N	.55	LM381	1.60	CD4070	.35	HM6116	16.50	**CONNECTORS**		Metal Enclosure	69.95
74161N	.70	LM382	1.60	CD4071	.30			30 pin edge	2.50		
74162N	.85	LM709H	.59	CD4072	.30	**CLOCKS**		44 pin edge	2.75	**LEDS**	
74163N	.85	LM723H/N	.49	CD4073	.35	MM5311	4.95	86 pin edge	4.00	Red T018	.15
74174N	.69	LM733N	.85	CD4075	.30	MM5312	3.90	100 pin edge	3.95	Green, Yellow T018	.20
74175N	.85	LM741CH	.35	CD4076	.95	MM5314	3.90	100 pin edge w/w	4.95	Jumbo Red	.25
74190N	1.15	LM741N	.35	CD4078	.30	MM5369	1.95			Green, Orange, Yellow Jumbo	.25
74192N	.79	LM747H/N	.75	CD4081	.30	MM5841	14.45	**IC SOCKETS**		**Cliplite LED Mounting Clips**	4/.80
74193N	.79	LM748N	.50	CD4082	.30	MM5865	7.95	**Solder Tin Low Profile**		(spec: red, ambex green, yellow, clear)	
74221N	1.25	LM1303N	1.75	CD4116	.47	CT7010	8.95	**PIN 1UP PIN 1UP**		**CONTINENTAL SPECIALTIES in stock**	
74298N	.85	LM1304	1.10	CD4490	5.50	CT7015	8.95	8 13 22 .30		Complete line of breadboard test equip.	
74365N	.65	LM1305	1.27	CD4507	.99	MM5375AA/N	3.90	14 14 24 .30			
74366N	.65	LM1307	1.10	CD4508	1.95	MM5375AG/N	4.90	16 16 28 .40		**OK WIRE WRAP TOOLS**	
74367N	.65	LM1310	2.75	CD4510	.95	7205	16.50	18 20 36 .58		Complete line of AP Products in stock.	
		LM1458	.55	CD4511	.94	7207	7.50	20 29 40 .49			
74LS00 TTL		LM1812	8.25	CD4515	2.25	7208	15.95			**SPECIAL PRODUCTS**	
74LS00N	.25	LM1889	2.49	CD4516	1.10	7209	4.95	**WIRE WRAP LEVEL 3**		2.5 MHz Freq. Counter Kit	37.50
74LS02N	.25	LM2111	1.75	CD4518	1.25			**PIN PIN**		30 MHz Freq. Counter Kit	47.75
74LS04N	.25	LM2902	2.25	CD4520	1.02	**MICROPROCESSOR**		14 .55 24 .93			
74LS05N	.25	LM3900N	.59	CD4527	1.51	6502	6.95	16 .57 28 1.00		**AC TRANSFORMERS**	
74LS08N	.35	LM3905	1.25	CD4528	1.25	6502A	9.50	18 .67 40 1.59		**FRAME**	**WALL PLUG**
74LS10N	.25	LM3909N	.95	CD4553	3.50	6504	6.95	2 level 14 pin w/w .20		6V 500 ma	$4.00 10V 2 amp $7.95
74LS13N	.55	MC1458V	.50	CD4566	2.45	6522	8.75			6.3V CT 600 ma	4.60 12V 250 ma 2.95
74LS14N	.99	NE550N	1.30	CD4583	2.35	6530	9.50			12V 250 ma	1.95 12V CT 250 ma 3.75
74LS20N	.25	NE555V	.39	CD4585	.95	6532	14.95	**CRYSTALS**		12.6V CT 600 ma	4.95 12V 500 ma 4.50
74LS22N	.25	NE556A	.65	CD40192	3.00	6551	11.85	1 MHz	4.50	12.6V CT 2 amps	5.95 12V 1 amp 5.95
74LS28N	.35	NE565A	1.00	74C00	.35	6800	5.70	2 MHz	3.95	12.6V CT 4 amp	8.60 12V 2 amp 7.95
74LS30N	.25	NE566V	1.50	74C04	.35	6802	11.95	4 MHz	3.95	12.6V CT 8 amp	10.80 6, 9, 12 VDC
74LS33N	.55	NE567V	1.00	74C10	.35	6820	4.95	5 MHz	3.95	24V CT 100 ma	3.95 300 ma 8.95
74LS38N	.35	NE570B	4.75	74C14	.75	6850	3.50	10 MHz	3.90	24V CT 600 ma	4.95 9 VDC 500 ma 3.75
74LS74N	.45	78L05	.60	74C20	.35	8080A	3.95	18 MHz	3.90		
74LS75N	.50	78L08	.60	74C30	.35	8085A	8.50	20 MHz	3.90	**Constant Voltage Transformers** 12V. 11 amp; 5V. 23 amp. 24V. 11 amp	15.00
74LS90N	.60	78M05	.85	74C48	1.95	Z80A	6.00	32 MHz	3.90		
74LS93N	.65	75108	1.49	74C74	.85	Z80B	18.95	32768 Hz	4.00		
74LS95N	.85	75491CN	.50	74C76	.80	Z80 P10	6.50	1.8432 MHz	4.50		
74LS107N	.40	75492CN	.55	74C90	1.25	Z80A P10	5.95	3.5795 MHz	1.20		
74LS112N	.45	75494CN	.89	74C93	1.25	Z80 CTC	5.95	2.0100 MHz	1.95		
74LS113N	.45			74C154	3.25	Z80A CTC	8.65	2.097152 MHz	3.95	**DISPLAY LEDS**	
74LS132N	.75	**A to D CONVERTER**		74C160	1.69	Z80 DART	15.25	2.4576 MHz	3.95	MAN72-74	CA CA .300 .75
74LS136N	.49	8038B	4.50	74C175	1.19	Z80A DART	18.75	3.2768 MHz	3.95	DL704	CC .300 1.25
74LS151N	.75	8700CJ	13.95	74C192	1.65	Z80 DMA	17.50	5.0688 MHz	3.95	DL707/DL707R	CA .300 1.00
74LS155N	.79	8701CN	22.00	74C221	1.90	Z80A DMA	27.50	5.185 MHz	3.95	DL727/728	CA CC .500 1.90
74LS157N	.75	8750CJ	13.95	74C905	6.00	Z80 S10:0	23.95	5.7143 MHz	3.95	DL747/750	CA CC .600 1.49
74LS162N	.95	LD130	9.95	74C906	.75	Z80A S10:0	28.95	6.5536 MHz	3.95	FND359	CC .357 .70
74LS163N	.95	9400CJ/V/F	7.40	74C914	1.95	Z80 S10:1	15.00	14.31818 MHz	3.95	FND500/507	CC CA .500 .99
74LS174N	.95	ICL7103	9.50	74C922	5.00	Z80A S10:1	23.90	18.432 MHz	3.95	FND503/510	CC CA .500 .99
74LS190N	1.00	ICL7107	14.25	74C923	5.50	Z80 S10:2	23.95	22.1184 MHz	3.95	FND800/807	CC CA .800 2.20
74LS221N	1.19			74C925	6.75	Z80A S10:2	28.95			10 digit display	1.25
74LS258N	.69	**CMOS**		74C926	6.95	Z80B CTC	17.95	**KEYBOARD ENCODERS**		7520 Clarex photocells	.39
74LS367N	.69	CD4000	.25	74C927	6.95	Z80B P10	17.95	AY5-2376	11.95	TIL311 Hex	9.50
		CD4001	.35			8212	1.85	AY5-3600PRO	17.95	MAN4610	CA .40 .99
LINEAR		CD4002	.35	**INTERFACE**		8214	3.75	74C922	5.49	MAN4640	CC .40 1.20
CA3045	.90	CD4006	.95	8095	.65	8216	1.80	74C923	5.50	MAN4710	CA .40 .95
CA3046	1.10	CD4007	.25	8096	.65	8224	2.50	HD0165-5	7.95	MAN4740	CC .40 1.20
CA3081	1.80	CD4008	.95	8097	.65	8228	4.95			MAN6640	CC .56 .99
CA3082	1.90	CD4009	.45	8098	.65	8251	4.75	**D Connectors RS232**		MAN6710	CA .60 .99
CA3089	3.40	CD4010	.45	8109	1.25	8253	8.95	DB25P	2.95	MAN6740	CC .60 .99
LM301AN/AH	.34	CD4011	.35	8110	1.75	8255	4.75	DB25S	3.50		
LM305H	.87	CD4012	.25	8113	1.40	8257	8.75	Cover	1.25	**TELEVIDEO TERMINAL**	
LM307N	.35	CD4013	.45	8120	4.95	8259	6.90			Model 950	$980.00
LM308N	.98	CD4014	.95	8123	1.75	1802CE plas	13.95				
LM309K	1.25	CD4015	.95	8124	1.75	1802E plas	17.95				
LM311H/N	.64	CD4016	.45	8125	3.20	1861P	5.95				

1981 IC MASTER CLOSEOUT $59.95

4116 200ns Dynamic RAM 8/$15.40



RCA Cosmac 1802 Super Elf Computer $106.95

The Super Elf is a small single board computer that does many **big** things. It's an excellent computer for training and for learning programming with its machine language and yet it's easily **expanded** with **additional memory, Full Basic, ASCII Keyboards, video character generation, etc.**

ROM monitor; State and Mode displays; Single step; Optional address displays; Power Supply; Audio Amplifier and Speaker; Fully socketed for all IC's; Full documentation.

The **Super Elf** includes a **ROM** monitor for program loading, editing and execution with **SINGLE STEP for program debugging** which is not included in others at the same price. With **SINGLE STEP** you can see the microprocessor chip operating with the **unique Quest** address and data bus displays **before, during** and **after** executing instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.

An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key **HEX keyboard** includes 16 HEX keys plus **load, reset, run, wait, input, memory protect, monitor select** and **single step**. Large, on board displays provide output and optional **high and low address**. There is a 44 pin standard connector slot for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for **all** IC's are included plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info. including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D.

Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95. Custom Cabinet** with drilled and labelled plexiglass front panel **$24.95.** All metal Expansion Cabinet, painted and silk screened, with room for 5S-100 boards and power supply **$57.00. NiCad Battery Memory Saver Kit $6.95.** All kits and options also completely assembled and tested.

Questdata, a software publication for 1802 computer users is available by subscription for $12.00 per 12 issues. Single issues $1.50. Issues 1-12 bound $16.50.

Moews Video Graphics **$3.50,** Games and Music **$3.00,** Chip 8 Interpreter **$5.50,** Starship 4K cassette **$14.95.** Exciting and challenging space game. Complete manual included.

Free 14 page brochure of complete Super Elf system.

Quest Super Basic V5.0

A new enhanced version of **Super Basic** now available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A complete function **Super Basic** by **Ron Cenker** including floating point capability with scientific notation (number range $\pm 1.7E^{38}$), 32 bit integer ± 2 billion; multi dim arrays, string arrays; string manipulation; cassette I/O; save and load, basic, data and machine language programs; and over 75 statements, functions and operations.

New improved faster version including **renumber** and essentially **unlimited variables.** Also, an exclusive user expandable command library.

Serial and Parallel I/O routines included.

Super Basic on Cassette $55.00.

Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed.** EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor $19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50.** A **50 pin connector set** with ribbon cable is available at **$18.95** for easy connection between the **Super Elf** and the **Super Expansion Board.**

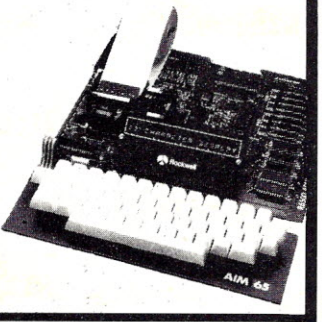
Power Supply Kit for the complete system (see Multi-volt Power Supply below).

Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display ROM monitor;, fully expandable. **$419.00.** 4K version **$449.00.** 4K Assembler **$35.00.** 8K Basic Interpreter **$65.00.**

Special small power supply 5V 2A 24V .5A assem. in frame **$59.00.** Molded plastic enclosure to fit both AIM 65 and power supply **$52.50.** AIM 65 1K in cabinet with power supply, switch, fuse, cord assem. **$559.00.** 4K **$579.00. A65/40-5000 AIM 65/40 w/16K RAM and monitor $1295.00.** RAM Board Kit (16K, **$195**) (32K, **$215**). VD640 Video Interface Kit **$119.00.** A&T **$149.00.** Complete AIM 65 in thin briefcase with power supply **$518.00.** Special Package Price: 4K AIM, 8K Basic, power supply, cabinet **$629.00**

AIM 65/KIM/SYM/Super Elf 44 pin expansion board; board with 3 connectors **$22.95.**



Super Color S-100 Video Kit $129.95

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80, etc. **Dealers: Send for excellent pricing/margin program.**

ELECTRONIC SYSTEMS KITS

Apple Peripheral Kits

SERIAL I/O INTERFACE 0 to 30,000 baud, D.T.R., Input & output from monitor or basic, or use Apple as intelligent terminal, Bd only (P/N 2) **$14.95,** Kit (P/N 2A) **$51.25,** Assembled (P/N 2C) **$62.95.**

PROTOTYPING BOARD (P/N 7907) **$21.95.**

PARALLEL TRIAC OUTPUT BOARD 8 triacs, each can switch 110V, 6A loads, Bd only (P/N 210) **$19.20,** Kit (P/N 210A) **$119.55.**

OPTO-ISOLATED INPUT BOARD 8 inputs, can be driven from TTL logic, Bd only (P/N 120) **$15.65,** Kit (P/N 120A) **$69.95.**

Interface Kits

SERIAL/PARALLEL INTERFACE Bidirectional, Baud rates from 110 to 19.2K, sw selectable polarity of input and output strobe, 5 to 8 data bits, 1 or 2 stop bits, parity odd or even or none, all characters contain a start bit, +5 & −12V required.Bd only (P/N 101) **$11.95,** Kit (P/N 101A) **$42.89.**

RS-232/TTL INTERFACE Bidirectional, requires ±12V, Kit (P/N 232A) **$9.95.**

RS-232/20mA INTERFACE Bidirectional, 2 passive opto-isolated circuits, Kit (P/N 7901A) **$14.95.**

PROM Eraser

Will erase 25 PROMs in 15 minutes. Ultraviolet, assembled. 25 PROM capacity **$37.50** (with timer **$69.50**). 6 PROM capacity OSHA/UL version **$78.50** (with timer **$108.50**).

NiCad Battery Fixer/Charger Kit

Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. No PC board. **$8.95**

Z80 Microcomputer

16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50.** Full Kit **$99.00.** Monitor **$20.00.** Power Supply Kit **$35.00.** Tiny Basic **$30.00.**

Modem Kit $60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included. Bd. only $17.00. Article in June *Radio Electronics*.

60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

Video Modulator Kit $9.95

Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply

8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12v option. ±5v, ±12v are regulated. Basic Kit **$35.95.** Kit with chassis and all hardware **$51.95.** Add $5.00 shipping. Kit of hardware **$16.00.** Woodgrain case **$10.00.** $1.50 shipping.

Type-N-Talk by Votrax

Text to speech synthesizer with unlimited vocabulary, built-in text to speech algorithm, 70 to 100 bits per second speech synthesizer, RS232C interface **$359.00.** Speech IC **$79.95.**

1802 16K Dynamic RAM Kit $149.00

Expandable to 64K. Hidden refresh w/clocks up to 4 MHz w/no wait states. Addl. 16K RAM **$25.00.**

S-100 4-slot expansion $ 9.95
Super Monitor VI.I Source Listing $15.00

Elf II Adapter Kit $24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

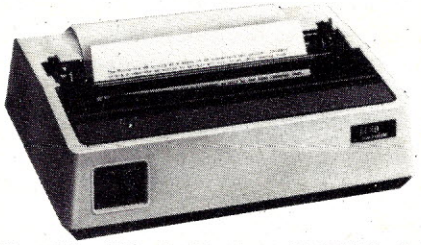
TERMS: $5.00 min. order U.S. Funds. Calif. residents add 6% tax. $10.00 min. VISA and MasterCard accepted. $1.00 insurance optional. Shipping: Add 5%; orders under $25.00—10%.

Prices subject to change

FREE: Send for your copy of our NEW 1982 QUEST CATALOG. Include 88¢ stamp.

Orange County • Sunnyvale
San Diego • Los Angeles
San Fernando Valley • Dallas

BETTER THAN EPSON ! - Okidata



Microline 82A *80/132 column,* ***120 CPS****, 9 x 9 dot matrix, friction feed, pin feed, adjustable tractor feed (optional), handles 4 part forms up to 9.5" wide, rear & bottom feed, paper tear bar, 100% duty cycle/200,000,000 character print head, bi-directional/logic seeking,* ***both serial & parallel interfaces included****, front panel switch & program control of 10 different form lengths, uses inexpensive spool type ribbons, double width & condensed characters, true lower case descenders & graphics*

PRM-43082 *Friction & pin feed* **$499.95**

Microline 83A *132/232 column, 120 CPS, handles forms up to 15" wide, removable tractor, plus all the features of the 82A.*

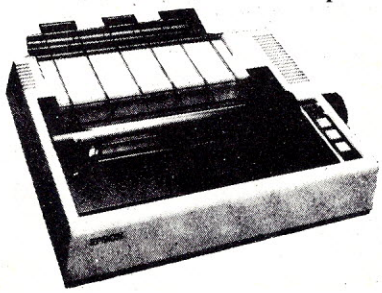
PRM-43083 *with FREE tractor* **$744.95**

Microline 84 *132/232 column, 200 CPS, full dot graphics built in, handles forms up to 15" wide, plus all the features of the 83A.*

PRM-43083 *with FREE tractor* ... **$1149.95**

PRA-27081	*Apple card*	**$39.95**
PRA-27082	*Apple cable*	**$19.95**
PRA-27087	*TRS-80 cable*	**$24.95**
PRA-43081	*2K hi spd serial card* ..	**$169.95**
PRA-43082	*Graphics ROMs 82A*	**$79.95**
PRA-43083	*Graphics ROMs 83A*	**$79.95**
PRA-43088	*Tractor option 82A*	**$39.95**
PRA-43080	*Extra ribbons pkg. of 2* ...	**$9.95**

INEXPENSIVE PRINTERS - Epson



MX-70 *80 column, 80 CPS, 5 x 7 dot matrix, adjustable tractor feed, & graphics*

PRM-27070 *List $459* **$389.95**

MX-80 *80 column, 80 CPS, bi-directional/logic seeking printing, 9 x 9 dot matrix, adjustable pin feed, & 64 graphics characters*

PRM-27080 *List $645* **$429.95**

MX-80FT *same as MX-80 with friction feed added.*

PRM-27082 *List $745* **$529.95**

MX-100 *132 column, correspondence quality, graphics, up to 15" paper, friction feed & adjustable pin feed, 9 x 9 dot matrix, 80 CPS.*

PRM-27100 *List $945* **$724.95**

PRA-27084	*Serial interface*	**$54.95**
PRA-27088	*Serial intf & 2K buffer* ..	**$144.95**
PRA-27081	*Apple card*	**$39.95**
PRA-27082	*Apple cable*	**$19.95**
PRA-27086	*IEEE 488 card*	**$52.95**
PRA-27087	*TRS-80 cable*	**$24.95**
PRA-27085	*Graftrax II*	**$75.00**
PRA-27090	*Extra print head*	**$44.95**
PRA-27083	*MX-80 ribbon cart.*	**$13.95**
PRA-27101	*MX-100 ribbon only*	**$9.95**

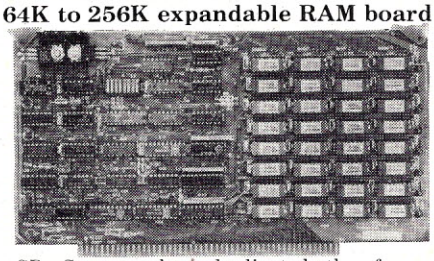
16K RAM Card for Apple II
was $175, Now Only $74.95

Expand your Apple's memory from 48K to 64K with this assembled & tested RAM Card that just plugs right into your Apple. Take advantage of this half price sale !!!

MEX-16700A *16K RAM Card* **$74.95**

SD Systems
ExpandoRAM III

64K to 256K expandable RAM board



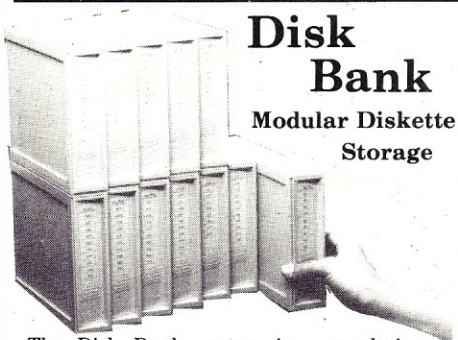
SD Systems has duplicated the famous reliability of their ExpandoRAM I and II boards in the new ExpandoRAM III, a board capable of containing 256K of high speed RAM. Utilizing the new 64K x 1 dymanic RAM chips, you can configure a memory of 64K, 128K, 192K, or 256K, all on one S-100 board. Memory address decoding is done by a programmed bipolar ROM so that the memory map may be dip-switch configured to work with either COSMOS/MPM-type systems or with OASIS-type systems.

Extensive application notes concerning how to operate the ExpandoRAM III with Cromemco, Intersystems, and other popular 4 MHz Z-80 systems are contained in the manual.

MEM-65064A	*64K A & T*	**$424.95**
MEM-65128A	*128K A & T*	**$494.95**
MEM-65192A	*192K A & T*	**$559.95**
MEM-65256A	*256K A & T*	**$595.00**

Disk Bank

Modular Diskette Storage



The Disk Bank system is a revolutionary diskette storage concept designed to handle all your diskette storage needs no matter how small or large.

The Disk Bank system can grow as your storage needs grow. Its modular interlocking design allows you to add to your system horizontally or verticallly. And Disk Bank's design allows easy accss to your diskettes. Just open the drawer and slide it out. The diskette retaining gate falls forward automatically for easy access to any of the 10 diskettes, without fear of bending or crimping. Shipping weight 1 lb.

MMA-405	*5¼" Disk Bank*	**$4.95**
MMA-408	*8" Disk Bank*	**$5.95**

Modems on Sale !!!!

SIGNALMAN - Anchor

Direct-connect automatic answer/originate selection, 300 Baud full duplex, Bell 103, includes RS-232 cable

IOM-5600A *Signalman* **$98.50**

SMARTMODEM - Hayes

Sophisticated direct-connect auto-answer/auto-dial modem, touch-tone or pulse dialing, RS-232C interface, programmable

IOM-5400A	*Smartmodem*	**$249.95**
IOK-1500A	*Hayes Chronograph* ...	**$219.95**
IOM-2010A	*Micromodem II*	**$329.95**
IOM-1100A	*Micromodem 100*	**$375.00**

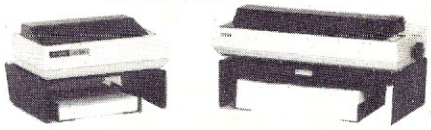
Apple-CAT - Novation

Software selectable 1200 or 300 Baud, direct connect, auto-answer/auto-dialse dialing, auxiliary 3-wire RS-232C serial port for printer

IOM-5232A *Save $50.00* **$325.00**

FMJ Inc
Printer Pal

Model P80 & P100



P80 dimensions: 14½" wide, 13" deep, 4½" high • P100 dimensions: 21" wide, 13" deep, 5½"high • Stores paper below printer • Constructed of 16 gauge steel • Attractive textured finish • Plastic trim and rubber feet • Adjustable paper support brackets.

The Printer Pal is a very simple, but convenient paper rack and printer stand. The Model P80 will support an 80 column printer such as the Epson MX80/MX80FT or the Okidata 82A. The Model P100 supports the larger 132 column printers like the Epson MX100 or the Okidata 83A. Either model performs the same function; to act as a stand for your printer while keeping your paper straight and tidy so you can spend your time computing instead of realigning your printer paper.

PRA-99080	*P80, 10 lbs*	**$24.95**
PRA-99100	*P100, 12 lbs*	**$29.95**

Place Orders Toll Free

Continental U.S.	*Inside California*
800-421-5500	**800-262-1710**

For Technical Inquires or Customer Service call:

213-973-7707

JADE ✓48

Computer Products

4901 W. Rosecrans, Hawthorne, Ca 90250

TERMS of SALE: Cash, checks, credit cards, or Purchase Orders from qualified firms and institutions. **Minimum Order $15.00.** California residents add 6% tax. Minimum shipping & handling charge $3.00. **Pricing & availibility subject to change**

JADE
Computer Products
3313 S. Bristol St.
Santa Ana, Calif.
714-549-7108

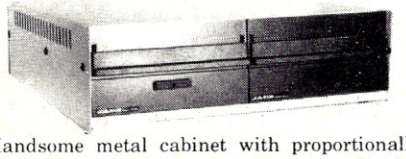
JADE
Computer Products
1291 W. El Camino Real
Sunnyvale, Calif.
415-965-7980

JADE
Computer Products
4344 Convoy Street
Kearny Mesa, Calif.
714-268-4661

PLACE ORDERS TOLL FREE.

Continental U.S. - 800-421-5500
Inside California - 800-262-1710
Los Angeles Area - 213-973-7707

JADE Disk Sub-Systems
Shugart, Siemens, Qume



Handsome metal cabinet with proportionally balanced air flow system • Rugged dual drive power supply • Power cable kit • Power switch, line cord, fuse holder, cooling fan • Never-Mar rubber feet • All necessary hardware to mount 2-8" disk drives, power supply, and fan • Does not include signal cable

Dual 8" Subassembly Cabinet

END-000420 *Bare cabinet* **$59.95**
END-000421 *Cabinet kit* **$225.00**
END-000431 *A & T* **$359.95**

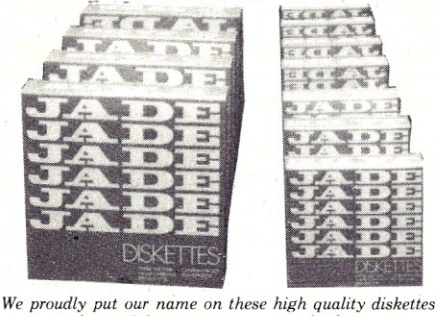
8" Disk Drive Subsystems
Single Sided, Double Density

END-000423 *Kit w/2 FD100-8Ds* . **$924.95**
END-000424 *A & T w/2 FD100-8Ds* **$1124.95**
END-000433 *Kit w/2 SA-801Rs* ... **$999.95**
END-000434 *A & T w/2 SA-801Rs* **$1195.00**

8" Disk Drive Subsystems
Double Sided, Double Density

END-000426 *Kit w/2 DT-8s* **$1224.95**
END-000427 *A & T w/2 DT-8s* ... **$1424.95**
END-000436 *Kit w/2 SA-851Rs* .. **$1295.00**
END-000437 *A & T w/2 SA-851Rs* **$1495.00**

DISKETTES - Jade



We proudly put our name on these high quality diskettes guaranteed to satisfy you or your money back.

5¼" Diskettes, Box of Ten

MMD—5110103 *SS, SD, 01S* **$29.00**
MMD—5111003 *SS, SD, 10S* **$29.00**
MMD—5111603 *SS, SD, 16S* **$29.00**
MMD—5120103 *SS, DD, 01S* **$31.00**
MMD—5121003 *SS, DD, 010* **$31.00**
MMD—5121603 *SS, DD, 16S* **$31.00**

8" Diskettes, Box of Ten

MMD—8110103 *SS, SD, 01S* **$31.00**
MMD—8120103 *SS, DD, 01S* **$39.00**
MMD—8220103 *DS, DD, 01S* **$48.00**

EPROM ERASER - Spectronics
Ultra-violet EPROM erasers

XME-3100A *With out timer* **$69.50**
XME-3101 *With timer* **$94.50**
XME-3200 *Economy Model* **$39.95**

16K MEMORY UPGRADE
Add 16K of RAM to your TRS-80, Apple, or Exidy in just minutes. We've sold thousands of these 16K RAM upgrades which include the appropriate memory chips (as specified by the manufacturer), all necessary jumper blocks, fool-proof instructions, and our 1 year guarantee.

MEX-16100K *TRS-80 kit* **$25.00**
MEX-16101K *Apple kit* **$25.00**
MEX-16102K *Exidy kit* **$25.00**

16K RAM CARD - for Apple II
Expand your Apple to 64K, 1 year warranty

MEX-16700A *Save $125.00 !!!* **$74.95**

Z-80* CARD for APPLE
Two computers in one, Z-80 & 6502, more than doubles the power & potential of your Apple, includes Z-80 CPU card, CP/M 2.2, & BASIC-80*

CPX-30800A *A & T* **$299.95**

8" DISK CONTROLLER
New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2/3.3, Pascal, & CPM 2.2, Shugart & Qume compatible

IOD-2700A *A & T* **$499.95**

2 MEGABYTES for Apple II
Complete package includes: Two 8" double-density disk drives, Vista double-density 8" disk controller, cabinet, power supply, & cables, DOS 3.2/3.3, CP/M 2.2, & Pascal compatible.

1 MegaByte Package *(Kit)* **$1495.00**
1 MegaByte Package *(A & T)* **$1695.00**
2 MegaByte Package *(Kit)* **$1795.00**
2 MegaByte Package *(A & T)* **$1995.95**

Apple-CAT - Novation
Software selectable 1200 or 300 baud, direct connect, auto-answer/auto-dial, auxiliary 3-wire RS232C serial port for printer.

IOM-5232A *Save $50.00!!!* **$334.95**

DISK DRIVES - Micro Sci
Inexpensive disk drives for your Apple

A2 *Direct replacement for Apple Disk II, works with Apple II controller as first or second drive.*

MSM-123101 *Micro Sci A2* **$429.95**
MSM-123101C *A2 with contrlr* **$499.95**

A40 *40 track drive for Apple II. Improved storage capacity and speed over Apple Brand drives - requires Micro Sci controller.*

IOD-2340A *Micro Sci A40* **$399.95**

A70 *70 track drive for Apple II. Twice the storage capacity and three times faster than Apple Brand drives - requires Micro Sci controller*

IOD-2370A *Micro Sci A70* **$499.95**

Micro Sci Controller *Disk controller for up to two Micro Sci A40 or A70 disk drives, DOS 3.2, 3.3, Pascal, and Z-80 SoftCard compatible, includes utility disk and 40/70 track patch.*

IOD-2300A *Micro Sci controller* **$95.00**

VISION 80 - Vista Computer
80 column x 24 line video card for Apple II, 128 ASCII characters, upper and lower case, 9 x 10 dot matrix with 3 dot descenders, standard data media terminal control codes, CP/M Pascal & Fortran compatible, 50/60 Hz

IOV-2400A *Vista Vision 80* **$375.00**

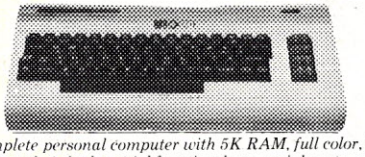
Joystick - T G Products
A better joystick for your Apple II

SYA-1512A *A & T* **$49.95**

CPS MULTICARD - Mtn. Computer
Three cards in one! Real time clock/calendar, serial interface, & parallel interface - all on one card.

IOX-2300A *A & T* **$179.95**

commodore VIC-20 Computer

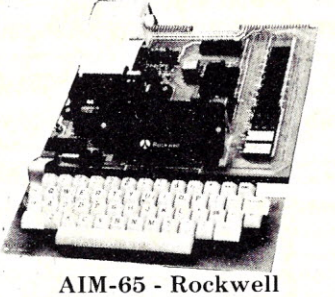


Complete personal computer with 5K RAM, full color, 61 key keyboard, 4 dual special-function keys, serial ports, cassette port, composite video output (connects to standard color TV set), BASIC language, & expansion port.

COM-VIC20 *VIC-20* **$279.95**

Z-80 STARTER KIT - SD Systems
Complete Z-80 microcomputer with RAM, ROM, I/O, keyboard, display, kludge area, manual, & workbook

CPS-30100K *KIT* **$299.95**
CPS-30100A *A & T* **$469.95**



AIM-65 - Rockwell
6502 computer with alphanumeric display, printer, & keyboard, and complete instructional manuals

CPK-50165A *1K AIM-65* **$424.95**
CPK-50465A *4K AIM-65* **$474.95**
SFK-74600008E *8K BASIC ROM* ... **$64.95**
SFK-64600004E *4K Assembler ROM* **$43.95**
PSX-030A *Power Supply* **$64.95**
ENX-000002 *Enclosure* **$54.95**
SFK-74600020E *PL/65 ROM* **$84.95**
SFK-74600010E *Forth ROM* **$64.95**
SFK-74600030E *Instant Pascal* **$99.95**

Special Packages
4K AIM-65, 8K BASIC, power supply & enclosure

Special Package Price **$649.95**

Video Monitors

HI-RES 12" GREEN - Zenith
15 MHz bandwidth, 700 lines/inch, P31 green phosphor, switchable 40 or 80 columns, small, light-weight & portable.

VDM-201201 *List price $150.00* **$118.95**

12" GREEN SCREEN - NEC
20 MHz, P31 phosphor video monitor with audio, exceptionally high resolution - A fantastic monitor at a very reasonable price

VDM-651200 *Special Sale Price* **$169.95**

12" COLOR MONITOR - NEC
Hi-res monitor with audio & sculptured case

VDC-651212 *Color Monitor* **$479.95**
NEC-1202D *RGB color monitor* ... **$1045.00**

Leedex / Amdek
Reasonably priced video monitors

VDC-801310 *13" Color I* **$379.95**
VDC-801320 *Color II* **$895.00**
IOV-2300A *DVM board for Apple* .. **$199.95**

Prices may be slightly higher at our retail locations. Please call the store nearest you for local price and availability.

JADE
Computer Products
13440 S. Hawthorne Blvd.
Hawthorne, Calif.
213-973-7330

JADE
Computer Products
21800 Ventura Blvd.
Woodland Hills, Calif.
213-716-6120

JADE
Computer Products
4950 Beltline Road
Addison, Texas
214-458-2782

PLACE ORDERS TOLL FREE.

Continental U.S. - 800-421-5500
Inside California - 800-262-1710
Los Angeles Area - 213-973-7707

SBC-200 - SD Systems
4 MHz Z-80A CPU with serial & parallel I/O, 1K RAM, 8K ROM space, monitor PROM included.
CPC-30200A *A & T* **$299.95**

THE BIG Z* - Jade
2 or 4 MHz switchable Z-80 CPU with serial I/O, accomodates 2708, 2716, or 2732 EPROM, baud rates from 75 to 9600*
CPU-30201K *Kit* **$139.95**
CPU-30201A *A & T* **$189.95**
CPU-30200B *Bare board* **$35.00**

2810 Z-80* CPU - Cal Comp Sys
2/4 MHz Z-80A CPU with RS-232C serial I/O port and on-board MOSS 2.2 monitor PROM, front panel compatible.*
CPU-30400A *A & T* **$269.95**

CB-2 Z-80 CPU - S.S.M.
2 or 4 MHz Z-80 CPU board with provision for up to 8K of ROM or 4K of RAM on board, extended addressing, IEEE S-100, front panel compatible.
CPU-30300K *Kit* **$239.95**
CPU-30300A *A & T* **$299.95**

16K STATIC RAM - Mem Merchant
4 MHz 16K static RAM board, IEEE S-100, bank selectable, Phantom capability, addressable in 4K blocks, "disable-able" in 1K segments, extended addressing, low power
MEM-16171A *A & T* **$154.95**

32K STATIC RAM - Jade
2 or 4 MHz expandable static RAM board uses 2114L's
MEM-16151K *16K 4 MHz kit* **$169.95**
MEM-32151K *32K 4 MHz kit* **$299.95**
Assembled & tested ..... add **$50.00**

MEMORY BANK - Jade
4 MHz, S-100, bank selectable, expandable from 16K to 64K
MEM-99730B *Bare Board* **$49.95**
MEM-99730K *Kit no RAM* **$199.95**
MEM-32731K *32K Kit* **$239.95**
MEM-64733K *64K Kit* **$279.95**
Assembled & Tested ..... add **$50.00**

64K RAM - Calif Computer Sys
4 MHz bank port / bank byte selectable, extended addressing, 16K bank selectable, PHANTOM line allows memory overlay, 8080 / Z-80 / front panel compatible.
MEM-64565A *A & T* **$575.00**

64K STATIC RAM - Mem Merchant
64K static S-100 RAM card, 4-16K banks, up to 8MHz
MEM-64400A *A & T* **$594.95**

64K STATIC RAM - SSM
IEEE 696/S-100 standard, up to 6MHz/8 Bit, 12MHz/16 Bit, 24 Bit extended addressing, disable-able in 2K increments
MEM-64300A *A & T* **$749.95**

64K STATIC - Lab Standard
Absolute IEEE 696/S-100 compliance, 8 or 16 Bit data paths, 16-bit request/acknowledge properly implemented, supports DMA at 8MHz, switchable bank select system for use with Cromemco & Alpha Micro
MEM-64900A *A & T* **$699.95**

BUS PROBE - Jade
S-100 diagnostic analyzer board, dynamic visual display of all 96 IEEE S-100 signals, aids in real time analysis of faulty hardware and software
TSX-200B *Bare Board* **$59.95**
TSX-200K *Kit* **$119.95**
TSX-200A *A & T* **$149.95**

VERSAFLOPPY II - SD SYSTEMS
Double density disk controller for any combination of 5¼" or 8" single or double sided disk drives, analog phase-locked loop data separator, vectored interrupt, CP/M 2.2 & OASIS compatible, control/diagnostic software PROM included
IOD-1160A *A & T* **$359.95**
SFC-55009047F *CP/M 2.2 for VF II* . **$99.95**

DOUBLE-D - Jade
Double density controller with the inside track, on-board Z-80A, printer port, IEEE S-100, can function on an interrupt driven buss*
IOD-1200K *Kit* **$299.95**
IOD-1200A *A & T* **$375.00**
IOD-1200B *Bare board* **$59.95**

DOUBLE DENSITY - Cal Comp Sys
5¼" and 8" disk controller, single or double density, with on-board boot loader ROM, and free CP/M 2.2 and manual set.*
IOD-1300A *A & T* **$374.95**

MPC-4 - SD Systems
Intelligent 4-port serial I/O card, on-board Z-80A, 2K RAM, 4K PROM area, on-board firmware, fully buffered, vectored interrupts, four CTC channels, add to SD Board set for powerful multi-user system
IOI-1504A *A & T w/software* **$495.00**

I/O-4 - S.S.M.
2 serial I/O ports plus 2 parallel I/O ports
IOI-1010K *Kit* **$179.95**
IOI-1010A *A & T* **$249.95**
IOI-1010B *Bare board* **$35.00**

I/O-5 - SSM Microcomputer
Two serial & 3 parallel I/O ports, 110-19.2K Baud
IOI-1015A *A & T* **$279.95**

I/O-8 - SSM Microcomputer
Eight software programmable serial I/O ports, 110 -19.2K Baud, ideal for multi-user systems
IOI-1018A *A & T* **$449.95**

PROM-100 - SD Systems
2708, 2716, 2732 EPROM programmer w/software
MEM-99520K *Kit* **$189.95**
MEM-99520A *A & T* **$249.95**

PB-1 - S.S.M.
2708, 2716 EPROM board with built-in programmer
MEM-99510K *Kit* **$154.95**
MEM-99510A *A & T* **$219.95**

EPROM BOARD - Jade
16K or 32K uses 2708's or 2716's, 1K boundary
MEM-16230K *Kit* **$79.95**
MEM-16230A *A & T* **$119.95**

ISO-BUS - Jade
Silent, simple, and on sale - a better motherboard
6 Slot (5¼" x 8⅝")
MBS-061B *Bare board* **$19.95**
MBS-061K *Kit* **$39.95**
MBS-061A *A & T* **$49.95**
12 Slot (9¾" x 8⅝")
MBS-121B *Bare board* **$29.95**
MBS-121K *Kit* **$69.95**
MBS-121A *A & T* **$89.95**
18 Slot (14½" x 8⅝")
MBS-181B *Bare board* **$49.95**
MBS-181K *Kit* **$99.95**
MBS-181A *A & T* **$139.95**

Single User System
SBC-200, 64K ExpandoRAM II, Versafloppy II, CP/M 2.2

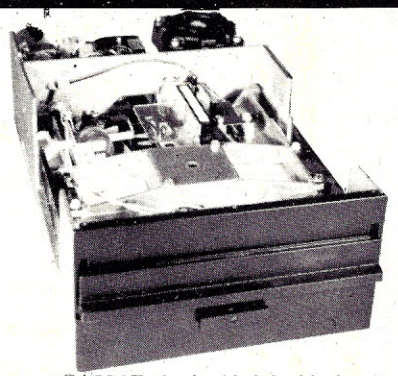
$1095.00

4 MHz Z-80A CPU, 64K RAM, serial I/O port, parallel I/O port, double-density disk controller, CP/M 2.2 disk and manuals, system monitor, control and diagnostic software.

Board set with 256K of RAM **$1295.00**

-All boards are assembled and tested-

8" Disk Drives



Shugart SA801R *single-sided double-density*
MSF-10801R .. $394.95 ea 2 for **$389.95 ea**

Shugart SA851R *double-sided double-density*
MSF-10851R .. $554.95 ea 2 for **$529.95 ea**

Qume DT-8 *double-sided double-density*
MSF-750080 .. $524.95 ea 2 for **$499.95 ea**

Siemens FDD 100-8 *sngl-sided dbl-density*
MSF-201120 .. $384.95 ea 2 for **$349.95 ea**

5¼" Disk Drives

Shugart SA400L *sngl-sided dbl-density 40 track*
MSM-104000 .. $234.95 ea 2 for **$224.95 ea**

Shugart SA450 *dbl-sided dbl-density 70 track*
MSM-104500 .. $349.95 ea 2 for **$329.95 ea**

Qume DT-5 *dbl-sided dbl-density 80 track*
MSM-750050 .. $359.95 ea 2 for **$349.95 ea**

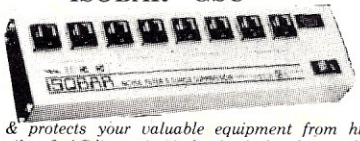
MPI B-51 *sngl-sided dbl-density 40 track*
MSM-155100 .. $234.95 ea 2 for **$224.95 ea**

MPI B-52 *dbl-sided dbl-density 40 track*
MSM-155200 .. $344.95 ea 2 for **$334.95 ea**

MPI B-91 *sngl-sided dbl-density 77 track*
MSM-155300 .. $369.95 ea 2 for **$359.95 ea**

MPI B-92 *dbl-sided dbl-density 77 track*
MSM-155400 .. $469.95 ea 2 for **$459.95 ea**

ISOBAR - GSC



Isolates & protects your valuable equipment from high voltage spikes & AC line noise, inductive isolated ground, 15 amp circuit breaker, U.L. listed
EME-115103 *3 socket* **$39.50**
EME-115105 *4 socket* **$49.50**
EME-115100 *8 socket* **$54.50**
EME-115110 *9 socket rackmount* **$74.50**

Prices may be slightly higher at our retail locations. Please call the store nearest you for local price and availability.

COMPONENTS

7400	.18	7454	.19
7402	.18	7470	.30
7404	.18	7472	.25
7406	.21	7474	.30
7408	.23	7475	.40
7409	.18	7476	.30
7410	.18	7480	.55
7411	.22	7481	1.00
7412	.28	7489	3.95
7413	.32	7490	.30
7414	.45	7491	.35
7416	.24	7492	.45
7417	.24	7494	.60
7420	.18	7495	.50
7421	.30	74100	.90
7425	.25	74107	.25
7427	.25	74122	.40
7430	.18	74125	.40
7432	.25	74144	2.50
7438	.25	74145	.50
7440	.18	74148	1.00
7442	.45	74154	1.00
7443	.60	74157	.45
7444	.60	74160	.80
7445	.60	74161	.80
7447	.60	74166	.90
7448	.60	74174	.80
7450	.18	74181	1.95
7451	.18	74393	1.00
7453	.19		

74LS SERIES

74LS00	.24	74LS122	.40
74LS02	.24	74LS123	.85
74LS03	.24	74LS125	.90
74LS04	.24	74LS126	.85
74LS05	.24	74LS132	.70
74LS06	.30	74LS136	.50
74LS08	.28	74LS138	.65
74LS10	.24	74LS139	.65
74LS11	.33	74LS145	1.10
74LS12	.33	74LS151	.70
74LS13	.45	74LS153	.70
74LS14	.89	74LS157	.70
74LS20	.24	74LS158	.70
74LS21	.24	74LS161	.85
74LS26	.30	74LS162	.85
74LS27	.28	74LS163	.85
74LS28	.32	74LS164	.85
74LS30	.24	74LS165	.85
74LS32	.32	74LS169	1.55
74LS37	.50	74LS170	1.55
74LS38	.32	74LS174	.85
74LS42	.50	74LS175	.85
74LS48	.70	74LS190	.90
74LS51	.24	74LS191	.90
74LS55	.35	74LS221	1.10
74LS74	.35	74LS240	.95
74LS75	.48	74LS241	.95
74LS76	.38	74LS244	.85
74LS78	.50	74LS245	1.65
74LS83	.70	74LS248	1.00
74LS86	.38	74LS249	.90
74LS90	.60	74LS251	1.20
74LS91	.85	74LS253	.80
74LS92	.65	74LS257	.80
74LS93	.60	74LS258	.80
74LS95	.80	74LS259	1.25
74LS107	.38	74LS260	.60
74LS109	.38	74LS273	1.50
74LS112	.40	74LS275	3.00
74LS113	.40	74LS279	.50
74LS114	.45	74LS283	.75
		74LS373	.90
		74LS374	1.50
		74LS377	1.40

74S SERIES

74S00	.35	74S86	1.10
74S02	.38	74S112	1.45
74S03	.38	74S132	1.10
74S04	.45	74S138	.95
74S05	.65	74S140	1.25
74S08	.40	74S158	1.25
74S10	.55	74S174	.95
74S15	.55	74S175	.95
74S20	.55	74S181	4.00
74S22	.75	74S182	2.75
74S30	.35	74S188	3.50
74S37	1.25	74S240	3.50
74S51	.60	74S244	3.50
74S65	.95	74S471	9.50
74S74	.55	74S472	15.00
74S85	2.00		

EPROMS

1702	4.25	8/3.95 ea
2708	2.95	8/2.65 ea
2716 (5V)	5.00	8/4.50 ea
TMS2716	8.95	8/8.00 ea
2732 (5V)	10.50	8/9.25 ea
TMS2532	11.50	8/10.25 ea

DYNAMIC RAMs

4027	2.00	8/1.75 ea
4116 200ns	1.75	8/13.00
4164 200ns	9.50	

STATIC RAMS

2111	2.85	8/2.50 ea
2112	2.85	8/2.50 ea
2114	2.00	4/14.00
2114L 200NS	2.25	4/2.00 ea
HM6116 200NS	11.50	4/10.50 ea

MISC.

8T26	1.20
8T28	1.20
8038	2.75
8080A	3.75
8155	10.50
8255	4.50
MC1330	1.65
MC1350	1.15
MC1358	1.50
MC1458	.55
LM380	1.10
LM386	1.40
LM565	.95
LM741	.25
LM1310	2.90
LM1800	2.95
LM1889	1.45
1488	.95
1489	.95
8212	1.95
8216	1.80
1103A	.95

CPU'S

Z80	8.50
Z80A	6.00
Z80A PIO	6.00
6502	6.00
6502A	12.00
8085A	8.50
MC6800	7.75

VOLTAGE REGULATORS

7805
7806
7808
7812
7818 .85
7905
7908
7912
7918

SPECIALS

ZENITH ZVM-121
Video Monitor / Green !!
12 inch
15 MHz

$ 118.50

8255 → $5.95
8748-8 → $31.00
3341PC → $2.00
MM5060 → 35¢
MC6800 → $7.75
MC6802 – $14.95
MC6850 → $4.50
MC6821 → $4.95

CARDS

MICROSOFT:
Z80 $295.00
16K RAM $160.00
VIDEX:
VIDEOTERM
80 column
$295.00
KEYBOARD
ENHANCER
$120.00
CALIF. COMP. SYS:
APPLE
CLOCK
$124.00
PROTO
BOARD
$25.00

PRINTERS

EPSON:
MX–80
15% OFF!
ST: $535.00
FT: $645.00

INTERFACE
CARD/CABLE
$78.50

CONCORD COMPUTER PRODUCTS

1971 SO. STATE COLLEGE
ANAHEIM, CALIF. 92806
(714) 937-0637
CHECK – M/O
NO COD
send $1.00 for catalog

$10. MIN ORDER / CA. RES. ADD 6%
FRT.

$10	49	$2.00	$250	499	$9.00
50	99	4.00	500	999	11.00
100	240	8.00	1000	UP	CALL

SPECIALS

3inch COMPUTER FANS w/cord → $9.95
2111 → 256×4 Static RAM → $1.75
8155 → RAM, I/O, Timer → $11.50
ER2051 → EAROM → $4.95
8085A → CPU → $8.50
MC6800 → CPU → $7.75
UPD 765A → Floppy Disk Controller → $19.95
2732A → 250ns EPROM → $15.50
AY5 1013A → 30K Band UART → $2.95
93419 → 64×9 Static RAM → $5.50
2901A → 4-Bit Slice → $7.50

4inch FAN
"Whisper"
w/cord
$8.95

6522
$5.25

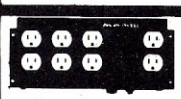
REAL–TIME CLOCK CALENDAR (MSM 5832)

Description: Mono Metal Gate CMOS I.C.

Features
- Time, Month, Date, Year, & Day of Week
- Bus Oriented
- 4 Bit Data Bus
- 4 Bit Address
- R/W Hold Selec.
- Inter. Signal
- 32.768Khz xtal Control
- 5v Pow. Sup.
- Low Power Dissipation

$7.45 W/SPEC's

XTAL
$2.85



NO Surges or Interference!!
THE MPD 117
turns an ordinary outlet into a cont-rolled power source
$79.50

"GLOBAL" LPK–1:

Logic Probe Kit - complete nothing extra to buy. Min. pulse width 300nsec.
$18.95

DISKETTE SALE!!

"WABASH"

	5¼	8inch	
SS/SD	$25.00	$25.00	Box of 10 pcs
SS/DD	27.40	30.40	
DS/SD	ø	34.90	
DS/DD	32.40	37.40	

QTY. PRICE AVAIL. | CALL FOR PRICE

COMPUTERS

ATARI® 800™ COMPUTER SYSTEM

400 w/16K $350.00
800 w/16K $699.00
★800 Computer w/48K
★BEST BUY $825.00

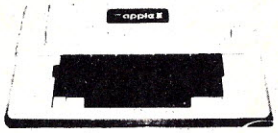
ATARI PERIPHERALS:

Printer "825" – 650.00
Disk Dr. "810" – 485.00
Record. "410" – 82.00
Paddle (pr.) / Joystick (pr.) → 16.95
32k RAM – 179.95
Basic Cart. – 49.00

- Asteroids
- Missle Com. → 32.50
- Sup. Brk. Out
- Assem. Edit. – 49.00
- Star Raiders – 45.00
- Basketball – 28.00
- Chess – 32.00

Other "ATARI" Hard / Software Avail. !!

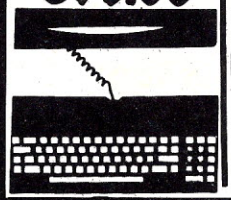
"APPLE II Plus"



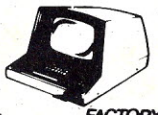
48k – $1250.00
64k – $1380.00
Other "APPLE" Equip. Avail. !!

TERMINALS

☆ADDS☆ VIEWPOINT
$579.00



SOROC



IQ 120

FACTORY WARRANTY
One year unconditional on CRT and keyboard. All else unconditionally warranted forever.

$689.00

★MONITORS★

ZENITH [1] 12in. 15MHz.
J.C.S. [2] 12in. 18MHz.
AMDEK [3] 12in. 12MHz.
13in Color [3a]

1. Green Phos. Hi–Res. → $118.50
2. Green Phos. Hi–Res. → $169.50
Non glare Screen
3. Green Phos. Hi–Res. → $155.50
3a. Lo–Res. → $375.50

Bare Bones APPLE II

w/48k RAM

w/o Keyboard
$450.
w/o Pwr. Supply

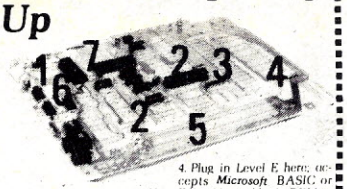
QUV-T8/2 by LOGICAL DEV...
"EPROM-Eraser"
•Erase up to 15 EPROM'S in 30min. $69.95
QTY. PRICE AVAIL.

'82
I.C. MASTER
$59.95

FOR ONLY $129.95 Learn Computing From The Ground Up

Build a Computer kit that grows with you, and can expand to 64k RAM, Microsoft BASIC, Text Editor/Assembler, Word Processor, Floppy Disks and more.

EXPLORER/85



1. Plug in Netronic's Hex Keypad/Display
2. Add Level B to convert to S100
3. Add 4k RAM
4. Plug in Level E here; accepts *Microsoft* BASIC or Editor/Assembler in ROM
5. Add two S100 boards
6. Add you own custom circuits (prototyping area)
7. Connect terminal

Here's the low cost way to learn the fundamentals of computing, the all-important basics you'll need more and more as you advance in computer skills. For just $129.95 you get the advanced-design Explorer/85 motherboard, with all the features you need to learn how to write and use programs. And it can grow into a system that is a match for any personal computer on the market. Look at these features: *8085 Central Processing Unit*, the microprocessor "heart" of the Explorer/85. (Join the millions who will buy and use the 8080/8085 this year alone!) . . . *Four 8-bit plus one 6-bit input/output ports* from which you can input and output your programs, as well as control exterior switches, relays, lights, etc. . . a cassette interface that lets you store and reload programs you've learned to write . . . *deluxe 2,000 byte operating system/monitor* makes it easy to learn computing in several important ways: • It allows simpler, faster writing and entering of programs • It permits access by you to all parts of the system so you can check on the status of any point in the program • It allows tracing each program step by step, with provision for displaying all the contents of the CPU (registers, flags, etc.) • . . . and it does much more!

You get all this in the starting level (Level A) of the Explorer/85 for only **$129.95.** Incredible! To use, just plug in your 8VDC power supply and terminal or keyboard/display — if you don't have them, see our special offers below.

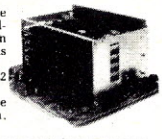
☐ Level A computer kit (Terminal Version) . . . **$129.95** plus $3 P&I.*

☐ Level A kit (Hex Keypad/Display Version) . . . **$129.95** plus $3 P&I.*

LEVEL B — This "building block" converts the motherboard into a two-slot S100 bus (industry standard) computer. Now you can plug in any of the hundreds of S100 cards available.

☐ Level B kit . . . **$49.95** plus $2 P&I.*

☐ S100 bus connectors (two required) . . . **$4.85** each, postpaid.



LEVEL C — Add still more computing power: this "building block" mounts directly on the motherboard and expands the S100 bus to six slots.

☐ Level C kit . . . **$39.95** plus $2 P&I.*

☐ S100 bus connectors (five required) . . . **$4.85** each, postpaid.

LEVEL D — When you reach the point in learning that requires more memory, we offer two choices: either add 4k of a memory directly on the motherboard, or add 16k to 64k of memory by means of a single S100 card, our famous "JAWS."

Level D kit: (CHECK ONE) . . ☐ 4k on-board . . **$49.95** plus $2 P&I.*; ☐ 16k S100 "JAWS" . . . **$149.95**, plus $2 P&I.*; ☐ 32k S100 "JAWS" . . . **$199.95** plus $2 P&I.*; ☐ 48k S100 "JAWS" . . . **$249.95** plus $2 P&I.*; ☐ 64k S100 "JAWS" . . . **$299.95** plus $2 P&I.*

LEVEL E — An important "building block," it activates the 8k ROM/EPROM space on the motherboard. Now just plug in our 8k Microsoft BASIC or your own custom programs.

☐ Level E kit . . . **$5.95** plus 50¢ P&I.*

Microsoft BASIC — It's the language that allows you to talk English to your computer! It is available three ways:

☐ 8k cassette version of Microsoft BASIC: (requires Level B and 12k of RAM minimum; we suggest a 16k S100 "JAWS" — see above) . . . **$64.95** postpaid.

☐ 8k ROM version of Microsoft BASIC: (requires Level B & Level E and 4k RAM; just plug into your Level E sockets. We suggest either the 4k Level D RAM expansion or a 16k S100 "JAWS.") . . . **$98.95** plus $2 P&I.*

☐ Disk version of Microsoft BASIC: (requires Level B, 32k of RAM, floppy disk controller, 8" floppy disk drive) . . . **$325** postpaid.

TEXT EDITOR/ASSEMBLER — The editor/assembler is a software tool (a program) designed to simplify the task of writing programs. As your programs become longer and more complex, the assembler can save you many hours of programming time. This software includes an editor program that enters the programs you write, makes changes, and saves the programs on cassettes. The assembler performs the clerical task of translating symbolic code into the computer-readable object code. The editor/assembler program is available either in cassette or a ROM version.

☐ Editor/Assembler (Cassette version: requires Level "B" and 8k (min.) of RAM — we suggest 16k "JAWS" — see above) . . . **$59.95** plus $2 P&I.*

☐ Editor/Assembler (ROM version, supplied on an S100 card; requires Level B and 4k RAM (min.) — we suggest either Level D or 16k "JAWS") . . . **$99.95** plus $2 P&I.*

8" FLOPPY DISK — A remarkable "building block." Add our 8" floppy disk when you need faster operation; more convenient program storage, perhaps a business application, and access to the literally thousands of programs and program languages available today. You simply plug them into your Explorer/85 disk system — it accepts all IBM-formatted CP/M® programs.

☐ 8" Floppy Disk Drive . . . **$499.95** plus $12 P&I.*

☐ Floppy Controller Card . . . **$199.95** plus $2 P&I.*

☐ Disk Drive Cabinet & Power Supply . . . **$69.95** plus $3 P&I.*

☐ Drive Cables (set up for two drives) . . . **$25.00** plus $1.50 P&I.*

☐ CP/M 2.2 Disk Operating System: includes Text Editor/Assembler, dynamic debugger, and other features that give your Explorer/85 access to thousands of existing CP/M-based programs . . . $150.00 postpaid.

NEED A POWER SUPPLY? Consider our AP-1. It can supply all the power you need for a fully expanded Explorer/85 (note: disk drives have their own power supply). Plus the AP-1 fits neatly into the attractive Explorer steel cabinet (see below).

☐ AP-1 Power Supply kit (8V @ 5 amps) in deluxe steel cabinet . . . **$39.95** plus $2 P&I.*

NEED A TERMINAL? We offer you choices: the least expensive one is our Hex Keypad/Display kit that displays the information on a calculator-type screen. The other choice is our ASCII Keyboard/Computer Terminal kit, that can be used with either a CRT monitor or a TV set (if you have an RF modulator).

☐ Hex Keypad/Display kit . . . . **$69.95** plus $2 P&I.*

☐ **FASTERM - 64 TERMINAL KIT** — Featuring a 56 key ASCII Keyboard, 128 character set upper and lower case, 75 ohm output, 8 baud rates: 150 to 19,200 (switch selectable), RS232/C or 20 MA output, 32 or 64 character by 16 line formats, complete with Deluxe Steel Cabinet and Power Supply . . . . **$199.95** plus $3 P&I.*

☐ RF Modulator kit (allows you to use your TV set as a monitor) . . . **$8.95** postpaid.

☐ 12" Video Monitor (10MHz bandwidth) . . . **$139.95** plus $5 P&I.*

☐ Deluxe Steel Cabinet for the Explorer/85 . . . **$49.95** plus $3 P&I.*

☐ Fan for cabinet . . . **$15.00** plus $1.50 P&I.*

ORDER A SPECIAL-PRICE EXPLORER/85 PAK — THERE'S ONE FOR EVERY NEED.

☐ **Beginner Pak** (Save $26.00) — You get Level A (Terminal Version) with Monitor Source Listing ($25 value) AP-1, 5-amp. power supply, Intel 8085 Users Manual . . . (Reg. $199.95) SPECIAL **$169.95** plus $4 P&I.*

☐ **Experimenter Pak** (Save $53.40) — You get Level A (Hex Keypad/Display Version) with Hex Keypad/Display, Intel 8085 User Manual, Level A Hex Monitor Source Listing, and AP-1,5-amp. power supply . . . (Reg. $279.95) SPECIAL **$219.95** plus $6 P&I.*

☐ **Special Microsoft BASIC Pak** (Save $103.00) — You get Levels A (Terminal Version), B, D (4k RAM), E, 8k Microsoft in ROM, Intel 8085 User Manual, Level A Monitor Source Listing, and AP-1, 5-amp. power supply . . . (Reg. $439.70) SPECIAL **$329.95** plus $7 P&I.*

☐ Add a Rom-Version Text Editor/Assembler (Requires levels B and D or S100 Memory) . . . **$99.95** plus $2 P&I.*

Starter 8" Disk System – Includes Level A, B floppy disk controller, one CDC 8" disk-drive, two-drive cable, two S100 connectors; just add your own power supplies, cabinets and hardware . . . ☐ (Reg. $1065.00) SPECIAL **$999.95** plus $13 P&I.* . . . ☐ 32k Starter System, **$1045.95** plus $13 P&I.* ☐ 48k Starter System, **$1095.95** plus $13 P&I.* ☐ 64k Starter System, **$1145.95** plus $13 P&I.*

☐ Add to any of above Explorer steel cabinet, AP-1 five amp. power supply, Level C with two S100 connectors, disk drive cabinet and power supply, two sub-D connectors for connecting your printer and terminal . . . (Reg. $225.95) SPECIAL **$199.95** plus $13 P&I.*

☐ **Complete 64K System** . Wired & Tested . . . **$1650.00** plus $26 P&I.*

☐ Special! Complete Business Software Pak (Save $625.00) — Includes CP/M 2.2 Microsoft BASIC, General Ledger, Accounts Receivable, Accounts Payable, Payroll Package . . . (Reg. $1325) SPECIAL **$699.95** postpaid.

*P&I stands for "postage & insurance." For Canadian orders, double this amount.

Continental Credit Card Buyers Outside Connecticut:

TO ORDER Call Toll Free: 800-243-7428

To Order From Connecticut, or For Technical Assistance, Call (203) 354-9375

CP/M is a reg. trademark of Digital Research

★ *(Clip and mail entire ad)* ★

SEND ME THE ITEMS CHECKED ABOVE

Total Enclosed (Conn. Residents add sales tax): $_____
Paid by:

☐ Personal Check ☐ Cashier's Check/Money Order

☐ VISA ☐ MASTER CARD (Bank No. _____)

Acct. No. _____ Exp. Date _____

Signature _____

Print Name _____

Address _____

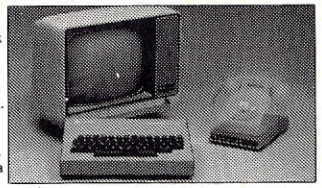
City _____

State _____ Zip _____

NETRONICS Research & Development Ltd.
333 Litchfield Road, New Milford, CT 06776

ANNOUNCING TWO NEW TERMINALS

Smart • Fast • Graphics • Matching Modem and $295 Printer



Netronics announces a state-of the art breakthrough in terminals, now at prices you can afford, you can go on-line with data-bank and computer phone-line services. It's all yours: "electronic newspapers," educational services, Dow-Jones stock reports, games, recipes, personal computing with any level language, program exchanges, electronic bulletin boards . . . and more every day!!!

Netronics offers two new terminals, both feature a full 56 key/128 character typewriter-style keyboard, baud rates to 19.2 kilobaud, a rugged steel cabinet and power supply. The simplest one, FASTERM-64, is a 16 line by 64 or 32 character per line unit, with a serial printer port for making hard copy of all incoming data, and optional provisions for block and special character graphics. The "smart" version, SMARTERM-80, features either 24 line by 80 characters per line or 16 by 40 characters per line, it offers on-screen editing with page-at-a-time printing, 12,000 pixel graphics, line graphics, absolute cursor addressing, underlining, reverse video, one-half intensity and much more . . . simply plug them into your computer or our phone modem and be on-line instantly. Use your TV set (RF modulator required) or our delux green-phosphor monitor pictured above. For hard copy just add our matched printer.

Price breakthrough!!! Own the FASTERM-64, a complete terminal kit, ready to plug in for just $199.95 or order the SMARTERM-80 kit for just $299.95, (both available wired and tested.) Be on-line with the million-dollar computers and data services today . . . we even supply the necessary subscription forms.

More good news: All the components in our terminals are available separately (see coupon), so you buy only what you need!!!

FASTERM-64 . . . DISPLAY FORMAT: 64 or 32 characters/line by 16 lines . . . 96 displayable ASCII characters (upper & lower case) . . . 8 baud rates: 150, 300, 600, 1200, 2400 4800, 9600, 19, 200, (switch sel.) . . . LINE OUTPUT: RS232/C or 20 ma current loop . . . VIDEO OUTPUT: 1V P/P (EIA RS-170) . . . CURSOR MODES: home & clear screen, erase to end of line, erase cursor line, cursor up & down, auto carriage return/line feed at end of line & auto scrolling . . . REVERSE VIDEO . . . BLINKING CURSOR . . . PARITY: off, even or odd . . . STOP BITS: 1, 1.5, 2 . . . DATA BITS PER CHARACTER: 5, 6, 7 or 8 . . . CHARACTER OUTPUT: 5 by 7 dot matrix in a 7 by 12 cell . . . PRINTER OUTPUT: prints all incoming data . . . 1K ON BOARD RAM . . . 2K ON BOARD ROM . . . CRYSTAL CONTROLLED . . . COMPLETE WITH POWER SUPPLY . . . OPTIONAL GRAPHICS MODE: includes 34 Greek & math characters plus 30 special graphics characters . . . ASCII ENCODED KEYBOARD: 56 key/128 characters.

SMARTERM-80 . . . DISPLAY FORMAT: 80 characters by 24 lines or 40 characters by 16 lines 128 displayable ASCII characters (upper & lower case) 8 baud rates: 110, 300, 600, 1200, 2400, 4800, 9600, 19, 200 . . . LINE OUTPUT: RS232/C or 20 ma current loop . . . VIDEO OUTPUT: 1V pp (EIA RS-170) . . . EDITING FEATURES: insert/delete line, insert/delete character, forward/back tab . . . LINE OR PAGE TRANSMIT . . . PAGE PRINT FUNCTION . . . CURSOR POSITIONING: up, down, right, left, plus absolute cursor positioning with read back . . . VISUAL ATTRIBUTES: underline, blink, reverse video, half intensity, & blank . . . GRAPHICS: 12,000 pixel resolution block plus line graphics . . . ON-SCREEN PARITY INDICATOR . . . PARITY: off, even or odd . . . STOP BITS: 110 baud 2, all others 1 . . . CHAR. OUTPUT: 7 by 11 character in a 9 by 12 block . . . PRINTER OUTPUT . . . 60 OR 50 Hz VERTICAL REFRESH . . . BLINKING BLOCK CURSOR . . . CRYSTAL CONTROLLED . . . 2K ON BOARD RAM . . . ASCII ENCODED KEYBOARD: 56 key/128 character . . . 4K ON BOARD ROM . . . COMPLETE WITH POWER SUPPLY.

TELEPHONE MODEM 103 O/A . . . FULL DUPLEX, FCC APPROVED . . . DATA RATE: 300 baud . . . INTERFACE: RS232/C and TTY . . . CONTROLS: talk/data switch (no need to connect and disconnect phone), originate/answer switch on rear panel . . . NO POWER SUPPLY REQUIRED.

ASCII KEYBOARD ASCII-3 . . . 56 KEY/128 CHARACTER ASCII ENCODED . . . UPPER & LOWER CASE . . . FULLY DEBOUNCED . . . 2 KEY ROLLOVER . . . POS OR NEG LOGIC WITH POS STROBE . . . REQUIRES +5 & -12V DC (SUPPLIED FROM VIDEO BOARDS)

PRINTER COMET I . . . SERIAL I/O TO 9600 BAUD . . . 80 CHARACTER COLUMN (132 COMPRESSED) . . . 10" TRACTOR FEED . . . UPPER/LOWER CASE . . . INDUSTRY STANDARD RIBBONS . . . 4 CHARACTER SIZES . . . 9 BY 7 DOT MATRIX . . . BI-DIRECTIONAL PRINTING

Continental U.S.A. Credit Card Buyers Outside Connecticut

CALL TOLL FREE 800-243-7428

To Order From Connecticut Or For Tech. Assist. Call (203) 354-9375

NETRONICS R&D LTD. Dept.
333 Litchfield Road, New Milford, CT 06776

Please send the items checked below:

☐ COMPLETE FASTERM-64 TERMINAL (includes FASTVID-64 video board ASCII-3 keyboard, steel cabinet and power supply) . . . kit $199.95 plus $3 P&I . . . wired & tested $249.95 plus $3 P&I . . . graphics option: add $19.95 to each of above

☐ COMPLETE SMARTERM-80 TERMINAL (includes SMARTVID-80 video board, ASCII-3 keyboard, steel cabinet and power supply) . . . kit $299.95 plus $3 P&I . . . wired and tested $369.95 plus $3 P&I

☐ FASTVID-64 VIDEO BOARD (requires +5 & -12V DC) . . . kit $99.95 plus $3 P&I . . . graphics option add $19.95 . . . wired & tested $129.95 plus $3 P&I . . . graphics option add $19.95

☐ SMARTVID-80 VIDEO BOARD (requires +5 & +/-12V DC) . . . kit $199.95 plus $3 P&I . . . wired & tested $249.95 plus $3 P&I

☐ DELUXE STEEL TERMINAL CABINET . . . $19.95 plus $3 P&I

☐ ASCII-3 KEYBOARD (requires +5 & -12VDC) . . . kit $69.95 plus $3 P&I . . . wired and tested $89.95 plus $3 P&I

☐ POWER SUPPLY (powers ASCII-3 keyboard & video boards) . . . kit only $19.95 plus $2 P&I

☐ ZENITH VIDEO MONITOR (high resolution green phosphor) . . . wired & tested $149.95 plus $6 P&I

☐ TELEPHONE MODEM MODEL 103 O/A . . . wired & tested $189.95 plus $3 P&I

☐ DOT MATRIX PRINTER Comet I . . . wired & tested $299.95 plus $10 P&I

☐ RF MODULATOR MOD RF-1 . . . kit only $8.95 plus $1 P&I

☐ 3FT-25 LEAD MODEM/TERMINAL OR PRINTER/TERMINAL CONNECTOR CABLE . . . $14.95 ea plus $2 P&I

For Canadian orders, double the postage . Conn. res. add sales tax.

Total Enclosed $ _____
☐ Personal Check ☐ Cashier's Check/Money Order
☐ VISA ☐ MasterCard (Bank No. _____)
Acct. No. _____ Exp. Date _____

Signature _____
Print Name _____
Address _____
City _____ State _____ Zip _____

7400

SN7400N	.20	SN7472N	.29	SN74156N	.79
SN7401N	.20	SN7473N	.35	SN74157N	.69
SN7402N	.25	SN7474N	.35	SN74160N	.89
SN7403N	.25	SN7475N	.49	SN74161N	.89
SN7404N	.25	SN7476N	.35	SN74162N	.89
SN7405N	.29	SN7479N	5.00	SN74163N	.89
SN7406N	.35	SN7480N	.50	SN74164N	.89
SN7407N	.35	SN7482N	.99	SN74165N	.89
SN7408N	.29	SN7483N	.69	SN74166N	1.25
SN7409N	.29	SN7485N	.89	SN74167N	2.79
SN7410N	.25	SN7486N	.35	SN74170N	1.95
SN7411N	.29	SN7489N	1.75	SN74172N	4.95
SN7412N	.35	SN7490N	.49	SN74173N	1.39
SN7413N	.40	SN7491N	.59	SN74174N	.99
SN7414N	.69	SN7492N	.45	SN74175N	.89
SN7416N	.29	SN7493N	.45	SN74176N	.79
SN7417N	.29	SN7494N	.69	SN74177N	.79
SN7420N	.25	SN7495N	.69	SN74179N	1.49
SN7421N	.29	SN7496N	.69	SN74180N	.79
SN7422N	.45	SN7497N	3.00	SN74181N	2.25
SN7423N	.29	SN74100N	1.49	SN74182N	.79
SN7425N	.29	SN74104N	.89	SN74184N	2.49
SN7426N	.29	SN74105N	.89	SN74185N	2.49
SN7427N	.25	SN74107N	.35	SN74190N	1.25
SN7428N	.49	SN74109N	.39	SN74191N	1.25
SN7430N	.25	SN74116N	1.95	SN74192N	.89
SN7432N	.29	SN74121N	.39	SN74193N	.89
SN7437N	.25	SN74122N	.55	SN74194N	.89
SN7438N	.40	SN74123N	.59	SN74195N	.69
SN7439N	.25	SN74125N	.49	SN74196N	.89
SN7440N	.20	SN74126N	.49	SN74197N	.89
SN7441N	.89	SN74132N	.75	SN74198N	1.49
SN7442N	.59	SN74136N	.75	SN74199N	1.49
SN7443N	1.10	SN74141N	.99	SN74221N	1.25
SN7444N	1.10	SN74142N	3.25	SN74251N	.99
SN7445N	.89	SN74143N	3.49	SN74276N	1.95
SN7446N	.79	SN74144N	3.49	SN74279N	.79
SN7447N	.69	SN74145N	.79	SN74283N	1.49
SN7448N	.79	SN74147N	1.95	SN74284N	3.95
SN7450N	.20	SN74148N	1.29	SN74285N	3.95
SN7451N	.20	SN74150N	1.25	SN74365N	.69
SN7453N	.20	SN74151N	.69	SN74366N	.69
SN7454N	.20	SN74152N	.69	SN74367N	.69
SN7459A	.25	SN74153N	.79	SN74368N	.69
SN7460N	.20	SN74154N	1.25	SN74390N	1.49
SN7470N	.29	SN74155N	.79	SN74393N	1.49

74LS

74LS00	.29	74LS92	.75	74LS192	1.15
74LS01	.29	74LS93	.75	74LS193	1.15
74LS02	.29	74LS94	.99	74LS194	1.15
74LS03	.29	74LS96	1.15	74LS195	1.15
74LS04	.35	74LS107	.45	74LS197	1.19
74LS05	.35	74LS109	.49	74LS221	1.19
74LS08	.35	74LS112	.49	74LS240	1.49
74LS09	.35	74LS113	.49	74LS241	1.49
74LS10	.35	74LS114	.49	74LS242	1.49
74LS11	.39	74LS122	.89	74LS243	1.49
74LS12	.35	74LS123	1.25	74LS247	1.19
74LS13	.59	74LS125	.59	74LS248	1.19
74LS14	.99	74LS126	.59	74LS249	1.19
74LS15	.35	74LS132	.99	74LS251	.99
74LS20	.35	74LS133	.89	74LS253	.99
74LS21	.35	74LS136	.49	74LS257	.89
74LS22	.35	74LS138	.89	74LS258	.69
74LS26	.35	74LS139	.89	74LS260	.69
74LS27	.35	74LS151	.89	74LS266	.69
74LS30	.35	74LS153	.89	74LS273	1.95
74LS32	.35	74LS154	1.75	74LS279	.89
74LS33	.59	74LS155	.89	74LS283	.89
74LS37	.45	74LS156	.89	74LS290	.99
74LS38	.39	74LS157	.89	74LS293	.99
74LS40	.35	74LS158	.89	74LS298	1.25
74LS42	.89	74LS160	1.15	74LS352	1.29
74LS47	.89	74LS161	1.15	74LS353	1.29
74LS48	1.15	74LS162	1.15	74LS363	.69
74LS49	1.15	74LS163	1.15	74LS366	.69
74LS51	.35	74LS164	1.15	74LS367	.69
74LS54	.35	74LS165	1.15	74LS368	.69
74LS55	.35	74LS166	1.19	74LS373	1.95
74LS73	.45	74LS168	1.19	74LS374	1.95
74LS74	.45	74LS169	1.19	74LS375	.89
74LS75	.59	74LS170	1.95	74LS386	.69
74LS76	.45	74LS173	.99	74LS393	2.49
74LS78	.49	74LS174	.99	74LS395	2.49
74LS83	.89	74LS175	.99	74LS670	2.49
74LS85	1.25	74LS181	2.95	81LS95	1.95
74LS86	.49	74LS190	1.25	81LS97	1.95
74LS90	.69	74LS191	1.25		

74S

74S00	.45	74S124	3.95	74S243	3.25
74S02	.45	74S133	.55	74S244	3.25
74S03	.45	74S134	.69	74S251	1.45
74S04	.55	74S135	1.19	74S253	1.45
74S05	.55	74S136	1.75	74S257	1.35
74S08	.50	74S138	1.35	74S258	1.35
74S09	.50	74S139	1.35	74S260	.79
74S10	.45	74S140	.79	74S280	2.95
74S11	.45	74S151	1.35	74S287	3.25
74S15	.45	74S153	1.35	74S288	2.75
74S20	.45	74S157	1.35	74S373	3.49
74S22	.45	74S158	1.35	74S374	3.49
74S30	.45	74S160	2.95	74S387	2.95
74S32	.55	74S162	2.95	74S471	10.95
74S38	1.25	74S174	1.59	74S472	10.95
74S40	.50	74S175	1.59	74S473	10.95
74S51	.45	74S181	2.95	74S474	12.95
74S64	.50	74S188	2.95	74S475	12.95
74S65	.50	74S194	1.95	74S570	5.95
74S74	.75	74S195	1.95	74S571	5.95
74S86	.79	74S196	1.95	74S572	9.95
74S112	.79	74S240	2.95	74S573	9.95
74S113	.79	74S241	2.95	74S940	3.15
74S114	.79	74S242	3.25	74S941	3.15

CA—LINEAR

CA3010H	.99	CA3060N	3.25	CA3089N	3.75
CA3013H	2.15	CA3080H	1.25	CA3096N	3.95
CA3023H	3.25	CA3080N	1.25	CA3130H	1.39
CA3035H	2.49	CA3081N	2.00	CA3140H	1.25
CA3039H	1.35	CA3082N	2.00	CA3160H	1.25
CA3046N	1.30	CA3083N	1.60	CA3401N	.59
CA3059N	3.25	CA3086N	.85	CA3600N	3.50

CD—CMOS

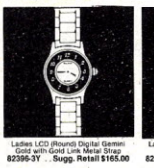
CD4000	.39	CD4041	1.49	CD 4098	2.49
CD4001	.39	CD4042	.99	CD4506	.75
CD4002	.39	CD4043	.89	CD4507	.99
CD4006	1.19	CD4044	.89	CD4508	3.95
CD4007	.25	CD4046	1.79	CD4510	1.39
CD4009	.49	CD4047	2.50	CD4511	1.29
CD4010	.49	CD4048	1.35	CD4512	1.49
CD4011	.39	CD4049	.49	CD4514	3.95
CD4012	.25	CD4050	.69	CD4515	2.95
CD4013	.49	CD4051	1.19	CD4516	1.49
CD4014	1.39	CD4052	1.19	CD4518	1.79
CD4015	1.19	CD4053	1.19	CD4519	.89
CD4016	.59	CD4054	2.95	CD4520	1.29
CD4017	1.19	CD4055	2.95	CD4526	1.79
CD4018	.99	CD4056	2.95	CD4528	1.79
CD4019	.49	CD4059	9.95	CD4529	1.95
CD4020	1.19	CD4060	1.49	CD4543	2.79
CD4021	1.39	CD4066	.79	CD4562	11.95
CD4022	1.19	CD4068	.39	CD4566	2.79
CD4023	.29	CD4069	.45	CD4584	2.49
CD4024	.79	CD4070	.55	CD4723	.75
CD4025	.23	CD4071	.49	CD4724	1.95
CD4026	2.95	CD4072	.49	MC14409	17.95
CD4027	.69	CD4073	.39	MC14410	18.95
CD4028	.89	CD4075	.39	MC14411	15.95
CD4029	1.49	CD4076	1.39	MC14412	15.95
CD4030	.49	CD4078	.55	MC14419	7.95
CD4034	3.49	CD4081	.39	MC14433	15.95
CD4035	.99	CD4082	.39	MC14538	2.49
CD4040	1.49	CD4093	.99	MC14541	1.95

Bulova Quartz Ladies Watches

LIMITED QUANTITY! — ONE YEAR FACTORY WARRANTY — WHILE THEY LAST!

Ladies LCD (Round) Digital Gemini Gold with Leather Strap
82395-SY . . . Sugg. Retail $140.00

Ladies LCD (Square) Digital Gemini Silver with Silver Mesh Metal Strap
80396-SW . . Sugg. Retail $150.00



Ladies LCD (Round) Digital Gemini Gold with Gold Link Metal Strap
82396-SY . . Sugg. Retail $165.00

Ladies LCD (Square) Digital Gemini Gold with Leather Strap
82397-SY . . Sugg. Retail $150.00

Your Choice — $69.95 ea. any Model

CALL OR SEND ORDER IN REFERENCING TO THIS AD FOR SPECIAL PRICE
Because of Limited Supply, please provide a second and third choice

LITRONIX Stick Display Sale

WHILE THEY LAST! — SALE!

MULTI-DIGIT REFLECTOR ARRAYS FOR CLOCKS

PART NUMBER/ COLOR	CHAR SIZ (IN.)	POLARITY	DESCRIPTION SEGMENT/DIGIT	OVERALL SIZE Length x Height x Depth	LIGHT OUTPUT (MCD) TYP	MIN	PEAK	FORWARD VOLTAGE SEGMENT (V) Vy = Black TYP	MAX	CONTINUOUS FORWARD CURRENT PER SEGMENT (mA) MAX	PRICE	2 FOR SALE
DL-4501 (Red)	.50	C.C. MPX non-MPX	With Colon and Auxiliary Indicators	3-3/8"x1-1/4"x5/16"	.8	.5	10	1.7	2.0	30	1.95	2/2.95
DL-4501 (Red)				3-3/8"x1"x5/16"	—	1.0					1.75	2/2.95
DLG-4501 (Grn)				3-3/8"x1"x5/16"	.8	.5					4.95	2/7.95
DL-4204 (Red)				3-3/8"x1"x5/16"							2.49	2/2.95

MULTI-DIGIT REFLECTOR ARRAYS

DL-230 (Red)	.3"	C.C. MPX	7 Seg. 2-Digit RHDP	11/16" x 1/8" x 1/4"	2.5	1.1	25	1.7	2.0	30	.79	2/.99
DLG-253 (Grn)	.5"	C.A. MPX	9 Seg. 2 Digit	1-1/2" x 1-1/2" x 5/16"		2.5	25		2.5	25	.89	2/1.19
DL-401 (Red)	.5"	C.C. MPX	5 Seg. 4 Digit RHDP	2" x 1-5/16" x 5/16"	.8	.5	10	1.7	2.0	30	1.49	2/1.95
DL-513 (Red)	1.0	C.A. MPX	7 Seg. 3 Digit RHDP	3-1/4"x1-13/16"x5/16"	1.5	1.0	10	3.4	4.0	30	2.25	2/3.49

NATIONAL Stick Display Sale

WHILE THEY LAST! LIMITED QUANTITY! — SALE!

LED NUMERIC ARRAYS

PART NO.	DIGIT SIZE (RED)	FORMAT	DRIVE Comm. Cathode/Comm. Anode	OVERALL SIZE	PRICE
NSA156	.100 (9 Bubble Stick)	8 8 8 8 8 8	C.C. 6 Digit Multiplexed	2"L x .72"H x .27"D	$ .59	2/.99
NSA196	.100 (9 Bubble Stick)	8 8 8 8 8 8 8 8 8	C.C. 9 Digit Multiplexed	2"L x .72"H x .27"D	.69	2/.99
NSA296	.100 (9 Bubble Stick)	8 8 8 8 8 8 8 8 8	C.C. 9 Digit Multiplexed	1.98"L x .72"H x .27"D	.69	2/.99
NSA1140	.100 (9 Bubble Stick)	8 8 . 8 8	C.C. 4 Digit Multiplexed	2"L x .72"H x .27"D	.49	2/.79
NSA1150	.100 (9 Bubble Stick)	8 . 8 8 . 8 8	C.C. 5 Digit Multiplexed	2"L x .72"H x .27"D	.49	2/.59
NSA1588	.140 (9 Bubble Stick)	8 8 8 8 8 8 8 8	C.C. 8 Digit Multiplexed	2-3/8"L x .72"H x .27"D	.69	2/1.19

MULTI-DIGIT LED NUMERIC DISPLAYS

NSN273	.3 No Decimal	8 8	C.C. 2 Digit Direct	.80"L x .80"H x .229"D	$ .69	2/.79
NSN274	.3 No Decimal	8 8	C.A. 2 Digit Direct	.80"L x .80"H x .229"D	.79	2/.99
NSN501	.5 No Decimal	8 8	C.C. 2 Digit Direct	1.40"L x 1.14"H x .32"D (1.16" pins)	.89	2/1.49
NSN502	.5 No Decimal	8 8	C.A. 2 Digit Direct	1.40"L x 1.14"H x .32"D (1.16" pins)	.89	2/1.49
NSN581	.5	8 8	C.C. 2 Digit Multiplexed	1"L x 1.05"H x .28"D (1.16" pins)	.99	2/1.79
NSN583	.5	8 8	C.C. 2 Digit Direct	1"L x 1.05"H x .28"D (1.16" pins)	.99	2/1.79
NSN781	.7	8 8	C.C. 2 Digit Multiplexed	1.2"L x 1.25"H x .3"D	1.19	2/1.95
NSN2100	.3	8 8 8 8 8 8 8 8	C.C. 8 Digit (10 Spaces)	4"L x .60"H x .250"D	.75	2/.89
NSN3001	.3	8 8 8 8	C.C. 4 Digit Multiplexed	1.59"L x .85"H x .25"D (1.16" pins)	.75	2/.89
NSN3382	.3	+1 8 8 8	C.A. 3½ Digit Multiplexed	1.60"L x .80"H x .225"D	.99	2/1.49
NSN3411	.3	8 8 8 8	C.A. 4 Digit – Colon/PM Indicator	1.9/16"L x 13/16"H x 3/16"D	.99	2/1.19
NSN3662	.3	+1 8 +88 88	C.C. 6 Digit – AM/PM, Failure Ind.	3"L x 1.10"H x 7/32"D	2.95	2/3.95
NSN3894	.3	8 8 8 8 8 8	C.A. 6 Digit Multiplexed	3"L x 1.3/32"H x 3/16"D	2.95	2/3.95
NSN3881*	.3	8 8 8 8	C.C. 4 Digit Multiplexed	1.59"L x .80"H x .225"D	2.95	2/4.95
NSN3882*	.3	8 8 8 8	C.A. 4 Digit Multiplexed	1.59"L x .80"H x .225"D	2.95	2/4.95
NSN5382*	.5	+1 8 8 8	C.A. 3½ Digit Multiplexed	1.95"L x 1.00"H x .28"D	3.49	2/5.95
NSN5441	.5	+88 88	C.C. 4 Digit – AM/PM, Colon Ind.	3.00"L x 1.10"H x .282"D	2.95	2/3.95
NSN5881*	.5	8 8 8 8	C.C. 4 Digit Multiplexed	1.99"L x 1.00"H x .280"D	3.49	2/5.95
NSN5882*	.5	8 8 8 8	C.A. 4 Digit Multiplexed	1.99"L x 1.00"H x .280"D	3.49	2/5.95
NSN5918	.5	+8 8 8 8	C.C. 5 Digit Multiplexed	3.00"L x 1.10"H x .282"D	2.49	2/3.49
NSN5922	.5	8 8 8 8 8	C.A. 5 Digit Multiplexed	3.00"L x 1.10"H x .282"D	2.95	2/3.49
NSN7923	.7	8 8 8 8 8	C.C. 6 Digit Multiplexed	3.60"L x 1.35"H x .282"D (1.0" pins)	3.95	2/4.95

*Standard Stocked Items — only pin-out specifications available on non stocked items.

COMPUTER GRADE CAPACITORS

16 SALE!

MFD	WVDC	PRICE
250	150	1.95
500	200	2.49
1,250	3	.99
1,500	25	1.95
1,500	50	2.95
2,000	10	1.95
2,250	100	3.95
2,300	33	2.95
2,500	16	1.95
3,000	25	1.95
3,600	40	3.95
4,500	15	1.95
5,500	25	4.49
6,100	40	2.49
6,600	15	2.49

MFD	WVDC	PRICE
10,000	15	2.95
10,000	15	3.95
11,000	19	4.95
11,000	55	6.49
11,000	60	5.95
13,000	16	2.95
14,000	13	2.95
14,000	35	3.95
18,000	18	3.95
20,000	20	2.95
20,000	55	3.95
21,000	15	3.95
23,000	7	1.95
23,000	10	2.95
23,000	20	3.95

MFD	WVDC	PRICE
24,000	20	2.95
27,000	10	2.95
32,500	25	4.95
40,000	25	5.95
43,000	10	5.95
50,000	20	7.95
52,000	20	5.95
55,000	15	5.95
58,000	20	5.95
65,000	10	7.95
73,000	5	7.95
80,000	15	9.95
90,000	10	8.95
160,000	10	8.95
200,000	3	12.95

OVER 200 OTHER VALUES AVAILABLE — CALL OR WRITE FOR YOUR REQUIREMENT

SALE! FOR THIS PRICE CODE 16 MR

LOW PROFILE (TIN) SOCKETS

	1-24	25-49	50-100
8 pin LP	.17	.16	.15
14 pin LP	.20	.19	.18
16 pin LP	.22	.21	.20
18 pin LP	.29	.28	.27
20 pin LP	.34	.32	.30
22 pin LP	.37	.36	.35
24 pin LP	.38	.37	.36
28 pin LP	.45	.44	.43
36 pin LP	.60	.59	.58
40 pin LP	.63	.62	.61

SOLDERTAIL (GOLD) STANDARD

	1-24	25-49	50-100
8 pin SG	.39	.35	.31
14 pin SG	.49	.45	.41
16 pin SG	.54	.49	.44
18 pin SG	.59	.53	.48
24 pin SG	.79	.75	.69
28 pin SG	1.10	1.00	.90
36 pin SG	1.65	1.40	1.26
40 pin SG	1.75	1.59	1.45

SOLDERTAIL STANDARD (TIN)

	1-24	25-49	50-100
14 pin ST	.27	.25	.24
16 pin ST	.30	.27	.25
18 pin ST	.35	.32	.30
24 pin ST	.49	.45	.42
28 pin ST	.99	.90	.81
36 pin ST	1.39	1.26	1.15
40 pin ST	1.59	1.45	1.30

WIRE WRAP SOCKETS (GOLD) LEVEL #3

	1-24	25-49	50-100
8 pin WW	.59	.54	.49
10 pin WW	.69	.63	.58
14 pin WW	.79	.73	.67
16 pin WW	.85	.77	.70
18 pin WW	.99	.90	.81
20 pin WW	1.19	1.08	.99
22 pin WW	1.49	1.35	1.23
24 pin WW	1.39	1.26	1.14
28 pin WW	1.69	1.53	1.38
36 pin WW	2.19	1.99	1.79
40 pin WW	2.29	2.09	1.89

1/4 WATT RESISTOR ASSORTMENTS – 5%

ASST. 1	5ea.	10 Ohm 12 Ohm 15 Ohm 18 Ohm 22 Ohm 27 Ohm 33 Ohm 39 Ohm 47 Ohm 56 Ohm	50pcs.	$1.95
ASST. 2	5ea.	68 Ohm 82 Ohm 100 Ohm 120 Ohm 150 Ohm 180 Ohm 220 Ohm 270 Ohm 330 Ohm 390 Ohm	50pcs.	$1.95
ASST. 3	5ea.	470 Ohm 560 Ohm 680 Ohm 820 Ohm 1K 1.2K 1.5K 1.8K 2.2K 2.7K	50pcs.	$1.95
ASST. 4	5ea.	3.3K 3.9K 4.7K 5.6K 6.8K 8.2K 10K 12K 15K 18K	50pcs.	$1.95
ASST. 5	5ea.	22K 27K 33K 39K 47K 56K 68K 82K 100K 120K	50pcs.	$1.95
ASST. 6	5ea.	150K 180K 220K 270K 330K 390K 470K 560K 680K 820K	50pcs.	$1.95
ASST. 7	5ea.	1M 1.2M 1.5M 1.8M 2.2M 2.7M 3.3M 3.9M 4.7M 5.6M	50pcs.	$1.95
ASST. 8R		Includes Resistor Assts. 1-7 (350 pcs.)		$10.95 ea.

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6% Sales Tax
Postage — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sale Flyer!

Spec Sheets — 25¢
Send 88¢ Postage for your
***FREE* 1982 JAMECO CATALOG**
Prices Subject to Change

NEW 1982 CATALOG

Mail Order Electronics · Worldwide
Jameco ELECTRONICS

1355 SHOREWAY ROAD, BELMONT, CA 94002
PHONE ORDERS WELCOME — (415) 592-8097

5/82

INTERSIL

Part No.	Function	Price
7045IPI	CMOS Precision Timer	14.95
7045EV/Kit*	Stopwatch Chip, XTL	24.95
7106CPL	3½ Digit A/D (LCD Drive)	16.95
7106EV/Kit*	IC, Circuit Board, Display	34.95
7107CPL	3½ Digit A/D (LED Drive)	15.95
7107EV/Kit*	IC, Circuit Board, Display	29.95
7116CPL	3½ Digit A/D LCD Dis. HLD.	18.95
7117CPL	3½ Digit A/D LCD Dis. HLD.	17.95
7201IDR	Low Battery Volt Indicator	2.25
7205IPG	CMOS LED Stopwatch/Timer	12.95
7205EV/Kit*	Stopwatch Chip, XTL	19.95
7206CJPE	Tone Generator	5.15
7206CEV/Kit*	Tone Generator Chip, XTL	12.95
7207AIPD	Oscillator Controller	6.50
7207AEV/Kit*	Freq. Counter Chip, XTL	13.95
7208IPI	Seven Decade Counter	17.95
7209IPA	Clock Generator	3.95
7215IPG	4 Func. CMOS Stopwatch CKT	13.95
7215EV/Kit*	4 Func. Stopwatch Chip, XTL	19.95
7216AIJI	8-Digit Univ. Counter C.A.	32.00
7216CIJI	8-Digit Freq. Counter C.A.	26.95
7216DIPI	8-Digit Freq. Counter C.C.	21.95
7217IJI	4-Digit LED Up/Down Counter	12.95
7218CIJI	8-Digit Univ. LED Drive	10.95
7224IPL	4½ Digit Up Counter DRI	11.25
7226AIJL	8-Digit Univ. Counter	14.95
7226AEV/Kit*	5 Function Counter Chip, XTL	74.95
7240IJE	CMOS Bin Prog. Timer/Counter	4.95
7242IJA	CMOS Divide-by-256 RC Timer	2.05
7250IJE	CMOS BCD Prog. Timer/Counter	6.00
7260IJE	CMOS BCD Prog. Timer/Counter	5.25
7555IPA	CMOS 555 Timer (8 pin)	1.45
7556IPD	CMOS 556 Timer (14 pin)	2.20
7611BCPA	CMOS Op Amp Comparator 5MV	2.25
7612BCPA	CMOS Op Amp Ext. Cmvr. 5MV	2.95
7621BCPA	CMOS Dual Op Amp Comp. 5MV	3.95
7631CCPE	CMOS Tri Op Amp Comp. 10MV	5.35
7641CCPD	CMOS Quad Op Amp Comp. 10MV	7.50
7642CCPD	CMOS Quad Op Amp Comp. 10MV	7.50
7660CPA	Voltage Converter	2.95
8038CCPD	Waveform Generator	4.95
8048CCPE	Monolithic Logarithmic Amp	21.60
8069CCQ	50ppm Band—GAP Volt Ref. Diode	2.50
8211CPA	Volt Ref/Indicator	2.95
8212CPA	Volt Ref/Indicator	2.95

74C

74C00	.39	74C95	1.59	74C221	1.95
74C02	.39	74C107	1.89	74C240	2.25
74C04	.39	74C151	2.95	74C244	2.25
74C08	.39	74C154	3.95	74C373	2.49
74C10	.39	74C157	2.25	74C374	2.59
74C14	.75	74C160	1.69	74C901	.69
74C20	.39	74C161	1.60	74C903	.69
74C30	.39	74C162	1.49	74C911	10.95
74C42	1.39	74C163	1.69	74C912	10.95
74C48	1.95	74C164	1.59	74C915	1.69
74C73	.79	74C173	1.39	74C917	10.95
74C74	.79	74C174	1.39	74C922	5.49
74C85	1.95	74C175	1.19	74C923	5.75
74C86	.99	74C192	1.69	74C925	7.50
74C89	6.95	74C193	1.69	74C926	7.50
74C90	1.29	74C195	1.59	80C95	.79
74C93	1.29			80C97	.79

LINEAR

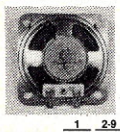
LH0002CN	6.85	LM340T-5	1.25	LM702H	.79
LM10CLH	4.50	LM340T-12	1.25	LM703CN	.89
LM11CLH	4.75	LM340T-15	1.25	LM709N	.29
LH0070-OH	4.95	LM341P-5	.75	LM710N	.79
TL071CP	.79	LM341P-12	.75	LM711N	.79
TL072CP	1.39	LM341P-15	.75	LM723N	.69
TL074CN	2.49	LM342P-12	.75	LM733N	1.00
LH0082CD	35.80	LM342P-15	.75	LM739N	1.19
TL082CP	1.19	LM342P-5	.69	LM741CN	.35
TL084CN	2.19	LM342P-12	.69	MC1741SCG	3.00
LH0094CD	36.80	LM342P-15	.69	LM747N	.79
LM300H	.99	LM348N	1.25	LM748N	.59
LM301CN	.35	LM350K	5.75	LM1014N	2.75
LM302H	1.95	LF351N	.60	LM1310N	1.95
LM304H	1.95	LF353N	1.00	LM1458CN	.59
LM305H	.99	LF355N	1.10	LM1488N	1.25
LM307CN	.45	LF356N	1.10	LM1489N	1.25
LM308CN	1.00	LM358N	1.00	LM1496N	1.95
LM309H	1.95	LM359N	1.79	LM1556V	1.75
LM309K	1.25	LM370N	4.49	LM1560N	2.95
LM310CN	1.75	LM373N	3.25	LM1871N	5.49
LM311/CN	.90	LM377N	2.95	LM1872N	5.49
LM312H	2.49	LM380N	1.25	LM1877N-9	3.25
LM317MP	1.15	LM381N	1.95	LM1889N	3.20
LM317T	1.75	LM382N	1.79	LM1896N	1.75
LM317K	3.95	LM384N	1.95	LM2002T	1.49
LM318CN	1.95	LM386N-3	1.29	LM2877P	2.05
LM319N	1.95	LM387N	1.45	LM2878P	2.25
LM320K-5	1.35	LM389N	1.35	LM2896P-1	2.25
LM320K-12	1.35	LM392N	.69	LM3189N	2.95
LM320K-15	1.35	LF398N	4.00	LM3900N	.69
LM320T-5	1.25	LM399H	5.00	LM3905CN	1.25
LM320T-12	1.25	TL494CN	4.49	LM3909N	1.15
LM320T-15	1.25	TL496CP	1.75	LM3914N	3.95
LM323K	5.95	NE510A	6.00	LM3915N	3.95
LM324N	.99	NE529A	4.95	LM3916N	3.95
LM329DZ	.65	NE531H	3.95	RC4136N	1.25
LM331N	3.95	NE536H	6.00	RC4151NB	3.95
LM334Z	1.30	NE540H	6.00	RC4194TK	5.95
LM335Z	1.40	NE544N	4.95	RC4195TK	5.49
LM336Z	1.75	NE550A	1.30	LM4500A	3.25
LM337T	1.95	NE555V	.39	ICL8038B	4.95
LM337MP	1.15	LM556N	.99	LM13080N	1.29
LM338K	6.95	NE564N	3.

UTIC
MINI STEREO FM RECEIVER
WITH HEADPHONES
For Joggers, Cyclists, and Skaters!

FEATURES: Lightweight headphones. Left/right balance control. Full fidelity stereo sound. Additional black soft carrying case & shoulder strap. Belt clip (hands free). Operates on 3 AA cell batteries (not incl.). Compact size: 3⅛" x 4⅞" x 1". Wt. 6 oz.

Model 1810 List Price $89.95 ..... **$29.95**

SPEAKERS



	1	2-9
Part# A0201	1.25	.99

2¼" Round — 8 Ohm
.25 Watt (4" Leads)
Size: 2¼" x ¾"

	1	2-9
Part# SF-25016	1.39	1.25

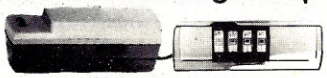
2½" Square — 16 Ohm
.25 Watt (4 mount. holes)
Large Ceramic Magnet
Size: 2⅝" x 2⅝" x ¾"

National Semiconductor
RAM SALE

STATIC RAMS
MM2114N-2 4K (200NS) ..... **$2.49 each**
(8 EACH $16.95/lot) (100 EACH $195.95/lot)
MM2114N-2L 4K (200NS) Low Power .... **$2.95 each**
(8 EACH $19.95/lot) (100 EACH $225.00/lot)
MM2147N 4K (70NS) ..... **$4.95 each**
(8 EACH $34.95/lot) (100 EACH $419.95/lot)
MM6116P-4 16K (200NS) ..... **$14.95 each**
(8 EACH $99.95/lot) (100 EACH $1195.00/lot)

DYNAMIC RAMS
MM4164N-20 64K (200NS) ..... **$14.95 each**
(8 EACH $99.95/lot) (100 EACH $1195.00/lot)
MM5290N-2 16K (150NS) 4116 ..... **$2.95 each**
(8 EACH $19.95/lot) (100 EACH $225.00/lot)
MM5290N-4 16K (250NS) 4116 ..... **$1.95 each**
(8 EACH $14.95/lot) (100 each $175.00/lot)

EPROM Erasing Lamp

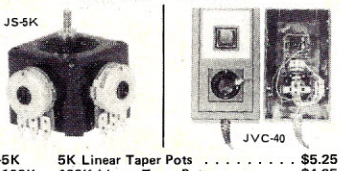


- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.
- Maintains constant exposure distance of one inch.
- Special conductive foam liner eliminates static build-up.
- Built-in safety lock to prevent UV exposure.
- Compact — only 7-5/8" x 2-7/8" x 2"
- Complete with holding tray for 4 chips.

UVS-11EL Replacement Bulb $16.95

UVS-11E **$79.95**

JOYSTICKS



JS-5K	5K Linear Taper Pots $5.25
JS-100K	100K Linear Taper Pots $4.95
JVC-40	40K (2) Video Controller in case $4.95

MUFFIN® FAN

The **dependable, low cost, largest selling fan for commercial cooling applications.**

- 105cfm free air delivery
- 4.68" sq. x 1.50" depth. Weight - 17 oz.
- acoustical rating as low as NC-38
- more than 10 yrs. cont. duty at 10°C
- impedance protected
- for ambients to 70°C
- UL yellow card recognized & CSA approved

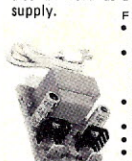
115V, 50/60Hz, 14 Watts, 105cfm — Ultrasonically cleaned & tested.

MU2A1 ....$9.95 ea.

NEW! JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.

FEATURES:
- Adjustable regulated power supplies, pos. and neg. 1.2VDC to 15VDC.
- Power Output (each supply): 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 175mA.
- Two, 3-terminal adj. IC regulators with thermal overload protection.
- Heat sink regulator cooling
- LED "on" indicator
- Printed Board Construction
- 120VAC input
- Size: 3-1/2"w x 5-1/16"L x 2"H



JE215 Adj. Dual Power Supply Kit (as shown) . . $24.95
(Picture not shown but similar in construction to above)
JE200 Reg. Power Supply Kit (5VDC, 1 amp) . . $14.95
JE205 Adapter Brd. (to JE200) ±5,±9 & ±12V. $12.95
JE210 Var. Pwr. Sply. Kit, 5-15VDC, to 1.5amp. $19.95

MICROPROCESSOR COMPONENTS

8080A/8080A SUPPORT DEVICES

INS8080A-	CPU	4.95
DP8212	8-Bit Input/Output	3.25
DP8214	Priority Interrupt Control	5.95
DP8216	Bi-Directional Bus Driver	3.49
DP8224	Clock Generator/Driver	3.95
DP8226	Bus Driver	3.49
DP8228	System Controller/Bus Driver	4.95
DP8238	System Controller	5.95
INS8243	I/O Expander for 48 Series	9.95
INS8250	Asynchronous Comm. Element	16.95
DP8251	Prog. Comm. I/O (USART)	6.95
DP8253	Prog. Interval Timer	8.95
DP8255	Prog. Peripheral I/O (PPI)	5.95
DP8257	Prog. DMA Control	9.95
DP8259	Prog. Interrupt Control	9.95
DP8275	Prog. CRT Controller	39.95
DP8279	Prog. Keyboard/Display Interface	9.95
DP8303	System Timing Element	6.95
DP8304	8-Bit Bi-Directional Receiver	3.95
DP8307	8-Bit Bi-Directional Receiver	3.95
DP8308	8-Bit Bi-Directional Receiver	3.95
DP8310	Octal Latched Peripheral Driver	5.25
DP8311	Octal Latched Peripheral Driver	5.25

6800/6800 SUPPORT DEVICES

MC6800	MPU	7.95
MC6802CP	MPU with Clock and RAM	14.95
MC6810AP1	128x8 Static RAM	4.95
MC6821	Peripheral Inter. Adapt (MC6820)	7.49
MC6828	Priority Interrupt Controller	17.95
MC6830L8	1024x8-Bit ROM (MC68A30-8)	14.95
MC6850	Asynchronous Comm. Adapter	6.95
MC6852	Synchronous Serial Data Adapter	6.95
MC6860	0-600bps Digital MODEM	10.95
MC6862	2400bps Modulator	12.95
MC6880A	Quad 3-State Bus. Trans. (MC8T26)	2.25

MICROPROCESSOR CHIPS

Z80 (780C)	CPU (MK3880N) (2MHz)	11.95
Z80A (780-1)	CPU (MK3880N-4) (4MHz)	13.95
CDP1802	CPU	19.95
2650	MPU	16.95
IDM2901ADC	CPU—4-Bit Slice (Com. Temp. Grade)	19.95
MC6502	MPU w/Clock (65K Bytes Memory)	11.95
INS8035N-6	MPU—8-Bit (6MHz)	7.95
INS8039N-6	CPU—Sgl. Chip 8-Bit (128bytes RAM)	9.95
INS8040N-6	CPU (256 Bytes RAM)	24.95
INS8070N	CPU—64 Bytes RAM	24.95
INS8073N	CPU w/Basic Micro Interpreter	29.95
P8085	CPU	9.95
TMS9900JL	MPU—16-Bit	39.95
1173AN-1	30 Tune Musical MPU Chip	8.95

SHIFT REGISTERS

MM500H	Dual 25-Bit Dynamic	.50
MM503H	Dual 50-Bit Dynamic	.50
MM506H	Dual 100-Bit Static	.50
MM510H	Dual 64-Bit Accumulator	.50
MM1402N	256-Bit Dynamic	2.95
MM5013N	1024-Bit Dynamic/Accumulator	1.95
MM5016H	500/512-Bit Dynamic	1.95
MM5034N	Octal 80-Bit	9.95
MM5035N	Octal 80-Bit	9.95
2504V(1404A)	1024-Bit Dynamic	1.95
2518N	Hex 32-Bit Static	3.95
2522V	Dual 132-Bit Static	2.95
2524V	512-Bit Dynamic	.99
2525V	1024-Bit Dynamic	2.95
2527V	Dual 256-Bit Static	2.95
2528V	Dual 250-Bit Static	4.00
2529V	Dual 240-Bit Static	4.00
2532N	Quad 80-Bit Static	2.95
3341PC	Fifo (Dual 80)	6.95

DATA ACQUISITION

AF100-1CN	Universal Active Filter 2.5%	5.95
AF121-1CJ	Touch Tone Low Band Filter	19.95
AF122-1CJ	Touch Tone High Band Filter	19.95
LM308CH	Super Gain Op Amp	1.15
LM334Z	Constant Current Source	1.30
LM335Z	Temperature Transducer	1.40
LF356N	JFET Input Op Amp	1.10
LF398N	Sample & Hold Amplifiers	3.95
LM399H	Temp.Comp. Prec. Ref. (.5ppm/C°)	5.00
ADC0804LCN	8-Bit A/D Converter (1 LSB)	4.95
DAC0806LCN	8-Bit D/A Converter (0.1% Lin.)	2.25

DATA ACQUISITION (CONTINUED)

ADC0809CCN	8-Bit A/D Converter (8-Ch. Multi.)	5.25
ADC0817CCN	8-Bit A/D Converter (16-Ch. Multi.)	10.95
DAC1000LCN	10-Bit/D/A Conv. Micro. Comp. (0.05%)	13.95
DAC1008LCN	10-Bit D/A Conv. Micro. Comp. (0.20%)	8.95
DAC1020LCN	10-Bit D/A Converter (0.05% Lin.)	8.49
DAC1022LCN	10-Bit D/A Converter (0.20% Lin.)	5.95
DAC1222LCN	12-Bit D/A Converter (0.20% Lin.)	9.95
CD4051N	8-Channel Multiplexer	1.19
AY-5-1013	30K BAUD UART	6.95

RAM'S

1101	256x1 Static	1.49
1103	1024x1 Dynamic	.99
2101 (8101)	256x4 Static	3.95
2102	1024x1 Static	1.75
21L02	1024x1 Static	1.95
2111 (8111)	256x4 Static	3.95
2112	256x4 Static MOS	4.95
2114	1024x4 Static 450ns	2.25
2114L	1024x4 Static 450ns Low Power	2.49
2114-2	1024x4 Static 200ns	2.49
2114L-2	1024x4 Static 200ns Low Power	2.95
74S200	256x1 Static	6.95
4116N-4 (UPD416)	16K Dynamic 250ns (MM5290N-4)	1.95
4164N-3	64K Dynamic 200ns	14.95
MM2147N	4096x1 Fast 70ns	4.95
5101	256x4 Static	7.95
MM5261	1024x1 Dynamic Fully Decoded	.99
MM5262	2Kx1 Dynamic	.49
MM5280/2107	4096x1 Dynamic	4.95
MM5290N-2 (4116)	16K Dynamic 150ns (UPD416C-3)	2.95
MM5298J-3A	8K Dyn. 200ns (lower ½ of MM5290J)	1.95
HM6116-4	16K (2Kx8) Static 200ns	14.95
82S25	64 Bit RAM (16x4OC)	3.49
UPD414/MK4027	4K Dynamic 16-pin	4.95
TMS4044-45NL	4K Static	9.95
TMS4045	1024x4 Static	9.95

PROMS/EPROMS

1702A	2K UV Erasable PROM	5.95
2708	8K EPROM	2.95
TMS2716	16K EPROM (-5V, +5V, +12V)	9.95
2716(Intel(2516)TI	16K EPROM (Single +5V)	8.95
2732Intel TI	32K EPROM	17.95
2758	8K EPROM (450ns) (Single +5V)	7.49
2764Q	64K EPROM (Hitachi HN462764)	49.95
5203	2048 PROM	14.95
82S23(74S188)	32x8 PROM (Open Collector)	3.95
82S115	4096 Bipolar PROM	14.95
82S123(74S288)	32x8 Tri-State Bipolar PROM	3.95
82S185	8K PROM	16.95

— Over 30 More PROMS Listed in Our Catalog —

ROM'S

2513(2140)	Character Generator (Upper Case)	9.95
2513(3021)	Character Generator (Lower Case)	9.95

NMOS READ ONLY MEMORIES

MCM66710P	128x9x7 ASCII Shifted w/Greek	13.50
MCM66740P	128x9x7 Math Symbol & Pictures	13.50
MCM66750P	128x9x7 Alpha, Control Char. Gen.	13.50

MICROPROCESSOR MANUALS

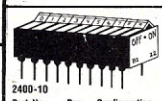
M-Z80	User Manual	7.50
M-CDP1802	User Manual	7.50
M-2650	User Manual	5.00

SPECIAL FUNCTION

DS0025CN	Dual MOS Clock Driver (SMZ)	3.50
DS0026CN	Dual MOS Clock Driver (SMZ)	1.95
INS1771N-1	Floppy Disc Controller	24.95
INS2651N	Communication Chip	19.95
MM58167N	Microprocessor Real Time Clock	8.95
MM58174N	Microprocessor Compatible Clock	11.95
COP402N	Microcontroller with 64-Digit RAM and Direct LED Drive	6.95
COP402MN	Microcontroller with 64-Digit RAM & Direct LED Drive w/N Buss Int.	7.49
COP470N	32-Seg.VAC Fluor. Driver (20-pin pkg.)	3.25

TELEPHONE/KEYBOARD CHIPS

AY-5-9100	Push Button Telephone Dialer	14.95
AY-5-9200	Repertory Dialer	14.95
AY-5-9500	CMOS Clock Generator	4.95
AY-5-2376	Keyboard Encoder (88 keys)	11.95
HD0165-5	Keyboard Encoder (16 keys)	7.95
74C922	Keyboard Encoder (16 keys)	5.49
74C923	Keyboard Encoder (20 keys)	5.75
MM53190N	Push Button Pulse Dialer	7.95
MM57493N	96/144-Key Serial Keyboard Encoder	8.95

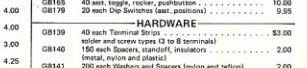


2400-10

EECO Rocker DIP Switch — "Mini-Dip™ 2400 Series
THE MOST UNIQUE DIP SWITCH AVAILABLE!
MINI-DIP is designed to retrofit all major brands of Dip switches. Unique features include locking rod design to prevent accidental actuation and gold self-wiping contact. One-piece housing and press-fit terminals prevent contamination. 2-10 station Form "A" and 1-5 station Form "C."
• Terminals on .100 x .300 (2.54 x 7.62) centers • PCB or dip socket mountable • Positive cleaning/wiping action with gold contact • Total seal and bottom seal

Part No.	Pos.	Configuration	Socket	Price
2400-2	2	12	8 pin	.79 - 10/ 6.95
2400-3	3	123	8 pin	.89 - 10/ 7.95
2400-4	4	1234	8 pin	.99 - 10/ 8.95
2400-ABCD	4	ABCD	8 pin	.99 - 10/ 8.95
2400-5C	6	C54321	14 pin	1.09 - 10/ 9.95
2400-6	6	123456	14 pin	1.09 - 10/ 9.95
2400-7	7	1234567	14 pin	1.19 - 10/10.95
2400-8	8	12345678	16 pin	1.29 - 10/11.95
2400-9	9	123456789	18 pin	1.39 - 10/12.95
2400-10	10	0123456789	20 pin	1.49 - 10/13.95

GRAB BAG SPECIALS



GB180 (Pictured Above)

CAPACITORS

Part No.	Description	Price
GB100	100 each Ceramic Disc (10pf—.1mf)	$2.00
GB101	60 each Mylar	4.00
GB102	60 each Electrolytics	4.00
GB103	40 each Tantalum (tubular & dipped)	4.00
GB176	40 each Dipped Mica (10pf-1000pf @ 100-500V)	4.00

INTEGRATED CIRCUITS

GB108	50 each TTL Series — marked (7400, 74107, 74123, etc.)	$4.00
GB109	30 each Linear — marked (LM301, 307, 741, 308, etc.)	4.00
GB148	30 each Exar — marked (XR320, 1310, 4136, etc.)	4.00
GB150	20 each Shift Registers — marked (2510, 2518, 2532, 2533, etc.)	4.00
GB157	50 each DTL Series — marked (DM930, 932, 936, 946, etc.)	3.00
GB158	6 pcs. Positive Voltage Regulators (TO-3 case) (7805, 06, 12, 15, 18, 24, etc.) Linear marked	4.25
GB159	6 pcs. Negative Voltage Regulators (TO-3 case) (7905, 06, 12, 15, 18, 24, etc.) Linear marked	4.00
GB170	25 each Assorted 74LS TTL Series	4.00
GB172	10 pcs. 78M Positive Volt. Reg. (TO-5 case) (78M05, 8, 12, 15, 20, 24, etc.) Linear marked	5.00

LEDS — LAMPS — READOUTS

GB110	100 each Assorted LEDs (colors & sizes) (XC556, XC836, etc.)	$6.00
GB111	40 each NE-2 Neon Type Lamps	3.00
GB112	20 ea. Multiple Readouts, calculators, sticks, timers, LEDS to Panaplex — new, used and rejects	4.00
GB162	50 each 7-Segment Displays (various colors and sizes)	5.00

POTENTIOMETERS

GB113	30 each Miniature Trimmers (100 ohm-1 Meg)	$4.00
GB134	24 each 3/8" square single-turn PC Mount (untested — 10 ohm to 500 ohm) marked	3.00
GB135	24 each 3/8" square single-turn PC Mount (untested — 1K to 5Meg) marked	3.00
GB136	24 each 3/8" square single-turn PC Mount (untested — 100K to 5 Meg) marked	3.00
GB173	100 ea. 3/8" sq. single-turn (U Test & Sort)	5.00
GB174	25 ea. ¾ watt thumbwheel single-turn (500 ohm-5 Meg).	2.00

DIODES

GB171	80 each Assorted Germanium (1N34, 1N68, 1N270)	$2.00
GB107	100 each Silicon (1N914/1N4148)	2.00
GB164	200 each unmarked rectifiers & zeners	2.00
GB175	100 ea. 1 amp - 3 amp (cathode band) silicon rectifiers	3.00

RESISTORS

Part No.	Description	Price
GB116	200 each 1/4 watt resistor assortment	$2.00
GB117	200 each 1/2 watt resistor assortment	2.00
GB118	30 ea. Wire Wound 5,10,20W (1-100 ohm)	4.00
GB165	40 asst. toggle, rocker, pushbutton	10.00
GB179	20 each Dip Switches (asst. positions)	9.95

HARDWARE

GB139	40 each Terminal Strips (solder and screw types (3 to 8 terminals)	$3.00
GB140	150 each Spacers, standoff, insulators (metal, nylon and plastic)	2.00
GB141	200 each Washers and Spacers (nylon and teflon)	2.00
GB142	50 ea. Chassis mounting feet (rubber and plastic)	2.00
GB144	200 each Solder lugs (small)	2.00
GB145	100 each Lugs — crimp on (some insulated)	2.00
GB146	100 each Grommets, cord strain reliefs and hole plugs	3.00
GB147	500 each Hardware mix (nuts, bolts, screws, lugs)	5.00
GB166	48 Threaded metal and plastic spacers (3-2" long)	2.00
GB167	200 pcs. sheet metal and metal tapping screws	2.00
GB168	200 pcs. angle bkts, clip insulators, etc.	3.00
GB169	100 pcs. tie wraps and harness clips (3-6")	3.00
GB180	100 pcs. Robot/Bot Car gears, shafts, wheels, motors	9.95

MISCELLANEOUS

GB123	30 each Heat Sinks — assorted sizes	$3.00
GB124	6 each assorted calculator-type keyboards	5.00
GB126	50 each Opto-Isolators — IL-1 Series (untested)	2.00
GB127	100 each Transistors — plastic and power	3.00
GB128	30 each Toroid Cores — iron and tape	4.00
GB129	50 each Photo Transistors (LPT)	4.00
GB130	1 each Tape Drive — 6V motor with read/write erase head and 2 cassette tapes (no amplifier)	5.00
GB131	30 each 6" shrink tubing, asst. sizes and colors	4.00
GB137	50 each Chokes, coils and inductors (molded-wire-adjustable)	3.00
GB138	2 each Speakers, 2½", 8 ohm, 1/4 watt	1.95
GB155	300 each mixed resistors, capacitors diodes, transistors, chokes	3.00
GB160	Printed Circuit Board Contains 50-75 components on each board	2.00
GB163	30 ea. Sockets (Asst. IC and transistor)	4.00
GB177	200 each 1" Shrink tubing, asst. colors and sizes	3.00

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6% Sales Tax
Postage — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sale Flyer!

Spec Sheets — 25¢
Send 88¢ Postage for your *FREE* 1982 JAMECO CATALOG
Prices Subject to Change

NEW 1982 CATALOG

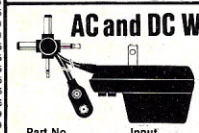
Mail Order Electronics · Worldwide
Jameco ELECTRONICS
1355 SHOREWAY ROAD, BELMONT, CA 94002
PHONE ORDERS WELCOME — (415) 592-8097

5/82

BOOKS
National Semiconductor — Intersil — Intel

30001	**National CMOS Data Book** (640 pages) 74C, CD4000, and A/D Converters	$5.95
30002	**National Interface Data Book** (704 pages) DP, DS8000, DS3600, DS76000, etc.	$5.95
30003	**National Linear Data Book** (1376 pages) LM, LF, ADC, DAC, LH Series	$8.95
30004	**National Series 80 — Board Level Computer** (224 pages)	$4.95
30005	**National TTL Logic Data Book** (640 pages) 7400,LS,L,H,S, and DM8000 Series	$8.95
30006	**Buy above (3) 30001,3,5 as a set**	$19.95/lot
30009	**Intersil Data Book** (1074 pages)	$6.95
010400	**Intel Component Data Catalog** Full data sheets for Intel's products incl. memory devices, microproc., peripherals & indust./mil. products (1328 pages)	$10.00
205610	**Intel Peripheral Design Handbook** Full data sheets, appl. notes for Intel peripheral device components (644 pages)	$7.50

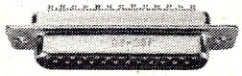
AC and DC Wall Transformers



With Universal Plug and 9V Battery Snap
Selective voltages: 6,9,12VDC. Polarity selection (+/-). six-foot line from adapter to plugs — six-inch line from adapter to battery snap. 120V/60Hz. 300mA.

Part No.	Input	Output	Price
AC 250	117V/60Hz	12VAC 250mA	$3.95
AC 500	117V/60Hz	12VAC 500mA	$4.95
AC1000	117V/60Hz	12VAC 1 amp	$5.95
AC1700	117V/60Hz	9VAC 1.7 amp	$3.95
DC 800	120V/60Hz	8VDC 400mA (batt. charger)	$2.49
DC6912 (above)	120V/60Hz	6,9,12VDC 300mA	$8.95
DV9200	117V/60Hz	9VDC 200mA	$3.25
DC900	120V/60Hz	9VDC 500mA	$3.95
DC1200	120V/60Hz	12VDC 300mA	$3.95

CONNECTORS

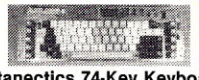


DB25P	D-Subminiature Plug	$2.95
DB25S	D-Subminiature Socket	$3.50
D20418-2	Screw Lock Hdwr. (2) DB25S/P	2/$.99
DB51226	Cover for DB25P/S	$1.75
22/44SE	P.C. Edge (22/44 Pin)	$2.95
UG88/U	BNC Plug	$1.79
UG89/U	BNC Jack	$3.79
UG175/U	UHF Adapter	$ .49
SO239	UHF Panel Recp.	$1.29
PL258	UHF Adapter	$1.60
PL259	UHF Plug	$1.60
UG260/U	BNC Plug	$1.79
UG1094/U	BNC Bulkhead Recp.	$1.29

TRS-80 16K Conversion Kit
Expand your 4K TRS-80 System to 16K
Kit comes complete with:
- 8 ea. MM5290 (UPD416/4116) 16K Dyn. Ram (*ns)
- Documentation for conversion

TRS-16K2 *150ns 19.95
TRS-16K3 *200ns 16.95
TRS-16K4 *250ns 14.95

KEYBOARDS



Datanectics 74-Key Keyboard
Uses EA 20134 Chip (Electronic Arrays). Size: 16¾"L x 5½"W x 1-3/8"H. White, black, blue, grey key caps. (No Data Sheet) —
Part No. KB354 ..... $29.95 ea.

Micro Switch 69-Key Keyboard
Uses AMI SW20350K Chip. Size: 16-3/8"L x 5¼"W x 1-5/8"H Metal Frame. Light & dark grey key caps (No Data Sheet) —
Part No. KB69SD12-2 ..... $19.95 ea.

Boschert Multi-Voltage Power Supply
5VDC, 12VDC and 24VDC

FEATURES: Voltages*: 5VDC @ 25amps, 12VDC @ 4amps, & 24VDC @ 4amps. Reg. Load: +5V out ±1%, +12 & 24V out ±5% (20-100% load). Overvolt. & overcurr. protection. 115 or 230VAC input. Wt. 4 lbs. Size: 4.95" x 2.50" x 15.00"
***Total average output shall not exceed 200 watts.**
General Description: The "Boschert" Power Supply was originally designed for application with ITT Advance Terminal Controller (ATC). This open frame switching power supply provides user with high current requirements common in use with computer systems. Its compact size provides versatility for mounting into electronic enclosures. Each supply has 6 threaded fasteners (4 per nut type) for mounting. Specification requirements to be used with ATC enclosed.
Part No. 200-3010 ..... $69.95 each
— MANY OTHERS AVAILABLE • WRITE FOR INFORMATION —

JE600 Hexadecimal Encoder Kit
FULL 8-BIT LATCHED OUTPUT 19-KEY KEYBOARD

The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3½"H x 8¼"W x 8¾"D

JE600/DTE-HK (After assembled as pictured above) **$99.95**
JE600 Kit 19-Key Hexadec. Keyboard, PC Board & Cmpnts. (no case) .. **$59.95**
K19 19-Key Keyboard (Keyboard only) **$14.95**
DTE-HK (case only — 3½"Hx8¼"Wx8¾"D) **$44.95**

✓See List of Advertisers on page 130

B. G. MICRO

P. O. Box 280298 Dallas, Texas 75228
(214) 271-5546
Visa • MasterCard • American Express

STATIC RAM

*21L02-1KX1 250 n.s.
Low Power ..... .95

2114L-3 1KX4 300 n.s.
Low Power 2.75 8/17.95

HM6116P-4-2KX8 + 5v-200 n.s.
CMOS Low Power 2716
Style Pin Out 13.50 8/95.00

6501-5 256X4 - CMOS - Data Retention 2 Volts - 22 Pin - 200 n.s. Typ. - 5V - Very Low Power .. 1.50

6514-J-5 1KX4-CMOS Super Low Power 350 n.s. Similar to 2114 Same Pin Out 2.95

8108-5 1KX8 NMOS 5V 500 NS 22 Pin 2.50

TMM2016-2KX8 + 5v-NMOS 200 n.s. - 2716 Style Pin Out 13.50 8/95.00

MK4104J-4 250NS
4K x 1 STATIC 18 PIN CERAMIC Computer Mfg. Surplus. PRIME. Fully Static. Easy to Use. Has Same Pin Out as TMS4044, but slightly different timing. With Specs. (Mostek)
8 for 12.00 32 for 39.95
VERY LOW POWER!

DYNAMIC RAM

2107B-4 (MM5280N-5)
4KX1 22 Pin 1.59

4027-4KX1-250 n.s. 1.75

*4116-16KX1-300 n.s. 8/12.95

*4116-16KX1-200 n.s. 8/15.95

4164- +5v 64K 12.95 8/95.00

CRYSTALS

262.144 Khz	1.10	9.90000 Mhz	1.25
300.000 Khz	1.25	10.69425 Mhz	2.49
4444.000 Khz	1.25	10.695000 Mhz	1.59
2.000000 Mhz	2.49	11.088 Mhz	1.59
4.433618 Mhz	1.00	14.31818 Mhz	2.49
5.000000 Mhz	2.49	4.916 Mhz Baud Rate	1.99
5.616 Mhz	1.59		

8080 SUPPORT

8080A	CPU	2.50
8216	Buffer	1.95
8251	USAR	4.95
8253	Baud Rate Gen.	5.95

VOLTAGE REGULATOR

7805	.99	7905	.99
7812	.99	7912	.99
7815	.99	7915	.99
7824	.99	7924	.99

LM317T - To 220 ..... 1.75
*LM323K-+5v-3A. To-3 ..... 3.95 3/10.00
LAS 1412-+12v-3A To-3 ..... 3.95 3/10.00

Z80

Z80A-4MHZ CPU 8.95
Z80PIO - Parallel 5.95
Z80SIO/O Chan. Ser. 24.95
Z80A SIO/O 29.95
*Z80DMA-DMA Controller 9.95
Z80 2.5 MHZ CPU 6.95

74LS

LS00	.24	LS30	.24	LS125	.95	LS166	.99	LS243	1.49	LS367	.79
LS02	.24	LS32	.36	LS138	.79	LS175	.89	LS244	.99	LS368	.79
LS04	.24	LS42	.49	LS139	.79	LS181	1.99	LS245	1.95	LS373	.99
LS05	.24	LS74	.44	LS151	.79	LS192	.89	LS257	.79	LS374	1.49
LS08	.24	LS85	.95	LS153	.79	LS193	.89	LS266	.59	LS375	1.19
LS10	.24	LS86	.39	LS154	1.75	LS221	1.10	LS283	.99	LS377	1.49
LS14	.89	LS90	.69	LS157	.79	LS240	.99	LS290	.99	LS390	1.19
LS20	.24	LS109	.39	LS161	.99	LS241	.99	LS293	1.75	LS393	1.19
LS27	.24	LS123	.99	LS164	.99	LS242	1.49	LS298	.89	LS399	.99

MISCELLANEOUS

*TR1602-UART same as AY5-1013 ..... 1.99
*IM6402-+5v High speed UART-AY5-1013 pin out 2.00
*MC1488-1489-RS232 Receiver and drive H.# - Pair 1.19
AY3-8910-Sound Chip with 60 page data manual 12.95
82S123-32X8 Tri State Bi polar PROM 3.99
MC1408L6 D to A Converter 8 Bit 1.79
AD561J D to A Converter 10 Bit 1.79
1771 Single Density FDC 22.50
1791 Double Density FDC 29.95
DM8131 6 Bit Unified Bus Comparator 2.99
8 Pin Dip Jumpers 3/1.00
82S129 Tri State Bi Polar Prom 2.59

CMOS

CD4001	.25	CD4049	.40
CD4011	.25	CD4050	.40
CD4012	.20	CD4066	.65
CD4013	.29	CD4511	.60
CD4017	.85	CD4520	.70
CD4023	.20	74C903	.20
CD4042	.60		

EPROM

*Asterik Denotes Super Specials

*1702A 256X8 1 us 2.50
2708 1KX8 450 n.s. 2.95
27A08 1KX8 350 n.s. 3.95
*2716 2KX8+5v 450 n.s. 5.95
*2716-1 2KX8+5v 350 n.s. 9.95
*2732 4KX8 450 n.s. Intel Pin Out 9.95
*2532 4KX8 450 n.s. T.I. Pin Out 9.95
2732A-3 4K x 8 350 n.s. Intel Pin Out Low Power 12.95

TTL

7400	.19	7474	.29
7402	.19	7486	.29
7404	.19	74109	.45
7406	.19	74125	.49
7408	.19	74154	1.19
7410	.19	74175	.79
7438	.22	74367	.59
7440	.19		

SPECIAL

8748 - M.P.U. - Intel
15.95
(While They Last)

74S

74SO4	.39
74S138	.95
74S240	1.99
74S244	1.99

DIP SWITCHES

5 Position	.65
6 Position	.70
7 Position	.80
8 Position	.90

SOCKETS

Low Profile SOLDER TAIL

8 Pin	13/1.00	20 Pin	7/1.00
14 Pin	10/1.00	24 Pin	6/1.00
16 Pin	8/1.00	28 Pin	6/1.00
18 Pin	8/1.00	40 Pin	5/1.00

BUY $10 GET $1.00 — FREE CHOICE

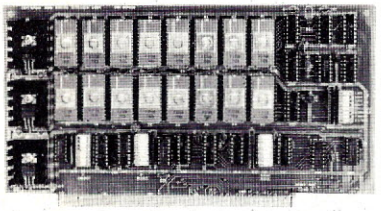
BIT SLICE

AMD2901-4 Bit Slice 7.95
AMD2903-4 Bit Super Slice 12.95
AMD2911 Sequencer 3.95
AMD29705-16 Register Files 4.95

TERMS: Add $1.50 postage, we pay balance. Orders over $50.00 add 85¢ for insurance. No C.O.D. Texas Res. add 5% Tax. 90 Day Money Back Guarantee on all items. All items subject to prior sale. Prices subject to change without notice. Foreign order - U.S. funds only. We cannot ship to Mexico. Countries other than Canada, add $3.50 shipping and handling.

DIGITAL RESEARCH COMPUTERS
(214) 271-3538

32K S-100 EPROM CARD
NEW!



$79.95 KIT

USES 2716's

Blank PC Board - $34

ASSEMBLED & TESTED ADD $30

SPECIAL: 2716 EPROM's (450 NS) Are $9.95 Ea. With Above Kit.

KIT FEATURES:
1. Uses +5V only 2716 (2Kx8) EPROM's.
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible.
4. Addressable as two independent 16K blocks.
5. Cromemco extended or Northstar bank select.
6. On board wait state circuitry if needed.
7. Any or all EPROM locations can be disabled.
8. Double sided PC board, solder-masked, silk-screened.
9. Gold plated contact fingers.
10. Unselected EPROM's automatically powered down for low power.
11. Fully buffered and bypassed.
12. Easy and quick to assemble.

32K SS-50 RAM

$259.95 KIT

For 2MHZ Add $10

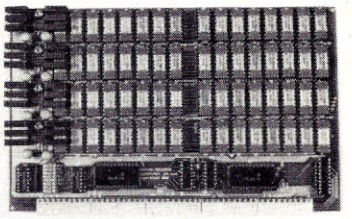
Blank PC Board $50

For SWTPC 6800 - 6809 Buss

Support IC's and Caps $19.95

Complete Socket Set $21.00

Fully Assembled, Tested, Burned In Add $30



At Last! An affordable 32K Static RAM with full 6809 Capability.

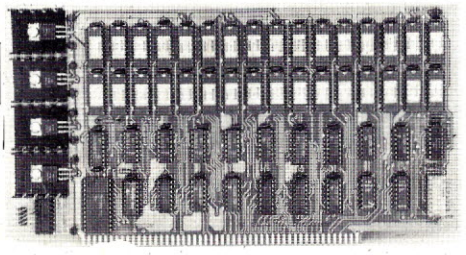
FEATURES:
1. **Uses proven low power 2114 Static RAMS.**
2. **Supports SS50C - EXTENDED ADDRESSING.**
3. **All parts and sockets included.**
4. **Dip Switch address select as a 32K block.**
5. **Extended addressing can be disabled.**
6. **Works with all existing 6800 SS50 systems.**
7. **Fully bypassed. PC Board is double sided, plated thru, with silk screen.**

16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!

$149.95 KIT

FOR 4MHZ ADD $10



KIT FEATURES:
1. Addressable as four separate 4K Blocks.
2. ON BOARD BANK SELECT circuitry. (Cromemco Standard!). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams.
4. ON BOARD SELECTABLE WAIT STATES.
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers.
6. All address and data lines fully buffered.
7. Kit includes ALL parts and sockets.
8. PHANTOM is jumpered to PIN 67.
9. LOW POWER: under 1.5 amps TYPICAL from the +8 Volt Buss.
10. Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA-**$33**
LOW PROFILE SOCKET SET-**$12**
SUPPORT IC'S & CAPS-**$19.95**
ASSEMBLED & TESTED-**ADD $35**

OUR #1 SELLING RAM BOARD!

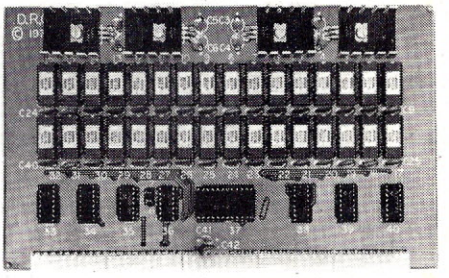
16K STATIC RAM SS-50 BUSS

PRICE CUT!

$139.95 KIT

FULLY STATIC!

FOR 2MHZ ADD $10



FOR SWTPC 6800 BUSS!

ASSEMBLED AND TESTED - $35

KIT FEATURES:
1. Addressable on 16K Boundaries
2. Uses 2114 Static Ram
3. Fully Bypassed
4. Double sided PC Board. Solder mask and silk screened layout
5. All Parts and Sockets included
6. Low Power: Under 1.5 Amps Typical

BLANK PC BOARD—**$35** COMPLETE SOCKET SET—**$12**
SUPPORT IC'S AND CAPS—**$19.95**

NEW! **STEREO! S-100 SOUND COMPUTER BOARD** NEW!

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

COMPLETE KIT! $84.95 (WITH DATA MANUAL)

BLANK PC BOARD W/DATA $31

KIT FEATURES:
- ★ TWO GI SOUND COMPUTER IC'S.
- ★ FOUR PARALLEL I/O PORTS ON BOARD.
- ★ USES ON BOARD AUDIO AMPS OR YOUR STEREO.
- ★ ON BOARD PROTO TYPING AREA.
- ★ ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED.
- ★ PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS.
- ★ EASY, QUICK, AND FUN TO BUILD. WITH FULL INSTRUCTIONS.
- ★ USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY.

Both Basic and Assembly Language Programming examples are included.

SOFTWARE:
SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M* compatible diskette or 2708 or 2716. Diskette - **$24.95** 2708 - **$19.95** 2716 - **$29.95.** Diskette includes the source. EPROM'S are ORG at E000H. **(Diskette is 8 Inch Soft Sectored)**

SPECIAL PURCHASE!

UART SALE!

TR1602B — SAME AS TMS6011, AY5-1013, ETC. 40 PIN DIP

TR1602B

$2.95 EACH **4 For $10.00**

CRT CONTROLLER CHIP
SMC #CRT 5037. PROGRAMMABLE FOR 80 x 24, ETC. VERY RARE SURPLUS FIND. WITH PIN OUT. $12.95 EACH.

4K STATIC RAM

National Semi. MM5257. Arranged 4K x 1. +5V, 18 PIN DIP. A Lower Power, Plug in Replacement for TMS 4044. 450 NS. Several Boards on the Market Will Accept These Rams. SUPER SURPLUS PURCHASE! **PRIME NEW UNITS!**

8 FOR $16 32 FOR $59.95

NEW! G.I. COMPUTER SOUND CHIP

AY3-8910. As featured in July, 1979 BYTE! A fantastically powerful Sound & Music Generator. Perfect for use with any 8 Bit Microprocessor. Contains: 3 Tone Channels, Noise Generator, 3 Channels of Amplitude Control. 16 bit Envelope Period Control, 2-8 Bit Parallel I/O. 3 D to A Converters, plus much more! All in one 40 Pin DIP. Super easy interface to the S-100 or other busses. **$11.95 PRICE CUT!**

SPECIAL OFFER: ~~$14.95~~ each Add $3 for 60 page Data Manual.

Digital Research Computers
(OF TEXAS)
P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

TERMS: Add $2.00 postage. We pay balance. Orders under $15 add 75¢ handling. No C.O.D. We accept Visa and MasterCharge. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over $50, add 85¢ for insurance.

ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A COPY OF THIS WARRANTY IS AVAILABLE FREE, ON REQUEST.

*TRADEMARK OF DIGITAL RESEARCH. WE ARE NOT ASSOCIATED WITH DIGITAL RESEARCH OF CALIFORNIA, THE SUPPLIERS OF CPM SOFTWARE.

NEW LOWER PRICES

"THE BIG BOARD"

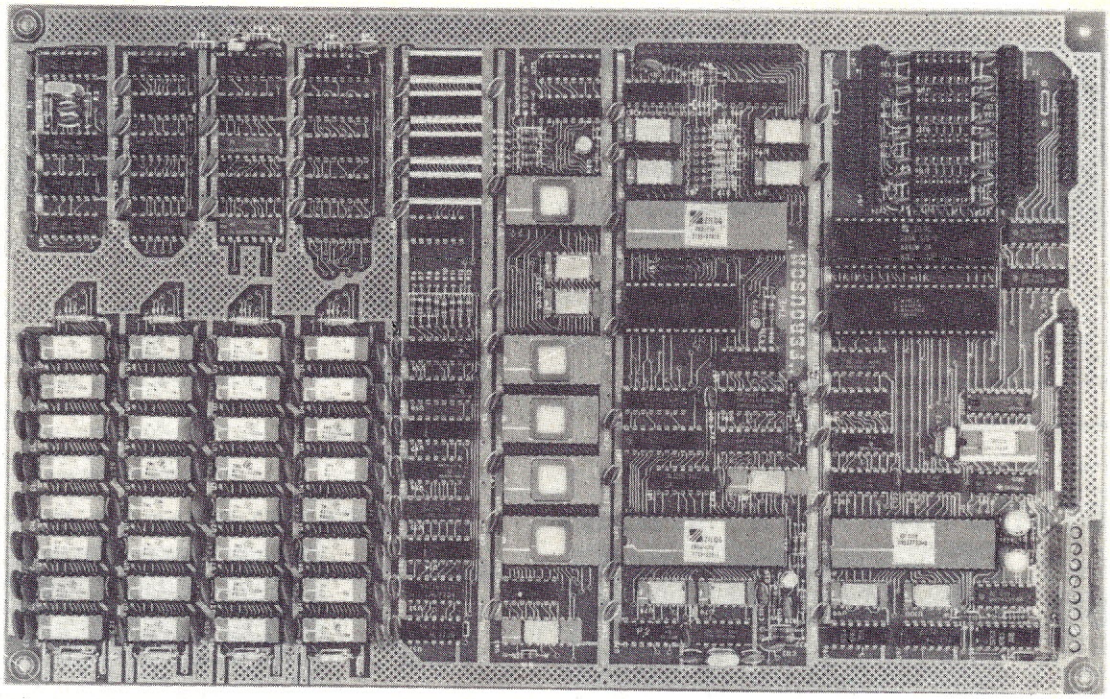
OEM - INDUSTRIAL - BUSINESS - SCIENTIFIC

SINGLE BOARD COMPUTER KIT!

Z-80 CPU! 64K RAM!

NEW!

PARTIALLY ASSEMBLED KITS
For All Sockets Installed
And Soldered Add $50.



WANT MORE INFO?
Full Documentation and
Schematics — $5.

THE FERGUSON PROJECT: Three years in the works, and maybe too good to be true. A tribute to hard headed, no compromise, high performance, American engineering! The Big Board gives you all the most needed computing features on one board at a very reasonable cost. The Big Board was designed from scratch to run the latest version of CP/M*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed! Take a Big Board, add a couple of 8 inch disc drives, power supply, an enclosure, C.R.T., and you have a total Business System for about 1/3 the cost you might expect to pay.

$499.00 ** (64K KIT BASIC I/0)

SIZE: 8½ x 13¾ IN.
SAME AS AN 8 IN. DRIVE.
REQUIRES: +5V @ 3 AMPS
+ - 12V @ .5 AMPS.

FULLY SOCKETED!

FEATURES: (Remember, all this on one board!)

64K RAM

Uses industry standard 4116 RAM'S. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

Z-80 CPU

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERUPTS. Fully buffered and runs 8080 software.

SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator. FULL RS232! For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 Int. Price for all parts and connectors: $65.

BASIC I/O

Consists of a separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

24 x 80 CHARACTER VIDEO

With a crisp, flicker-free display that looks extremely sharp even on small monitors. Hardware scroll and full cursor control. Composite video or split video and sync. Character set is supplied on a 2716 style ROM, making customized fonts easy. Sync pulses can be any desired length or polarity. Video may be inverted or true. 5 x 7 Matrix - Upper & Lower Case

FLOPPY DISC CONTROLLER

Uses WD1771 controller chip with a TTL Data Separator for enhanced reliability. IBM 3740 compatible. Supports up to four 8 inch disc drives. Directly compatible with standard Shugart drives such as the SA800 or SA801. Drives can be configured for remote AC off-on. Runs CP/M* 2.2.

TWO PORT PARALLEL I/O (OPTIONAL)

Uses Z-80 PIO. Full 16 bits, fully buffered, bi-directional. User selectable hand shake polarity. Set of all parts and connectors for parallel I/O: $19.95

REAL TIME CLOCK (OPTIONAL)

Uses Z-80 CTC. Can be configured as a Counter on Real Time Clock. Set of all parts: $9.95

BLANK PC BOARD — $175

The blank Big Board PC Board comes complete with full documentation (including schematics), the character ROM, the PFM 3.3 MONITOR ROM, and a diskette with the source of our BIOS, BOOT, and PFM 3.3 MONITOR.

CP/M* 2.2 FOR BIG BOARD

The popular CP/M* D.O.S. to run on Big Board is available for $159.00.

PRICE CUT!

PFM 3.3 2K SYSTEM MONITOR

The real power of the Big Board lies in its PFM 3.0 on board monitor. PFM commands include: Dump Memory, Boot CP/M*, Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search. PFM occupies one of the four 2716 EPROM locations provided.

Z-80 is a Trademark of Zilog.

Digital Research Computers
(OF TEXAS)
P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

TERMS: Shipments will be made approximately 3 to 6 weeks after we receive your order, VISA, MC, cash accepted. We will accept COD's (for the Big Board only) with a $75 deposit. Balance UPS COD. Add $4.00 shipping.

USA AND CANADA ONLY

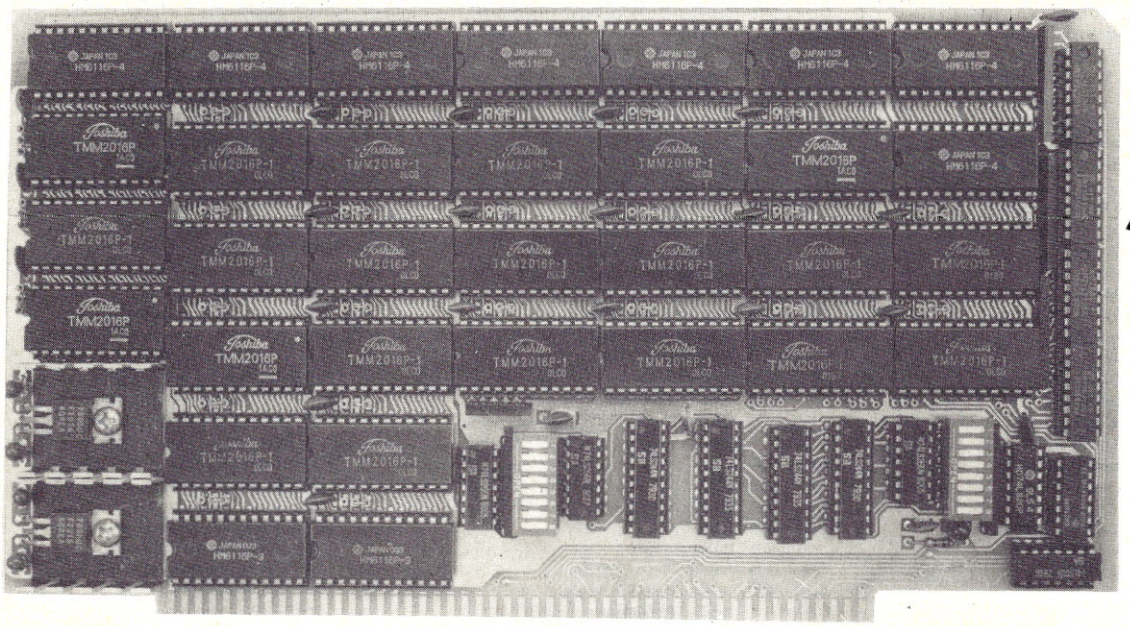
U.K. AND EUROPE: CONTACT VINCELORD LTD. 47 GOLDHURST TERRACE LONDON NW6

*TRADEMARK OF DIGITAL RESEARCH. NOT ASSOCIATED WITH DIGITAL RESEARCH OF CALIFORNIA, THE ORIGINATORS OF CPM SOFTWARE
**1 TO 4 PIECE DOMESTIC USA PRICE.

64K S100 STATIC RAM

NEW! **$399.00 KIT** **NEW!**

LOW POWER!



RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $55

SUPPORT ICs + CAPS -	**$17.50**
FULL SOCKET SET -	**$14.50**

ASSEMBLED AND TESTED **ADD $40**

FEATURES:

FULLY SUPPORTS THE NEW IEEE 696 S100 STANDARD (AS PROPOSED)

- ★ Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- ★ Fully supports IEEE 696 24 BIT Extended Addressing.
- ★ 64K draws only approximately 500 MA.
- ★ 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- ★ SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- ★ 2716 EPROMs may be installed in any of top 48K.
- ★ Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- ★ Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- ★ BOARD may be partially populated as 56K.

FOR 56K KIT $349.00

16K STATIC RAMS?

The new 2K x 8, 24 PIN, static RAMs are the next generation of high density, high speed, low power, RAMs. Pioneered by such companies as HITACHI and TOSHIBA, and soon to be second sourced by most major U.S. manufacturers, these ultra low power parts, feature 2716 compatible pin out. Thus fully interchangeable ROM/RAM boards are at last a reality, and you get BLINDING speed and LOW power thrown in for virtually nothing.

Digital Research Computers
(OF TEXAS)
P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

TERMS: Add $2.00 postage. We pay balance. Order under $15 add 75¢ handling. No. C.O.D. We accept Visa and MasterCharge Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over $50, add 85¢ for insurance.

Microcomputing T.M. ● List of Advertisers

Reader Service Number		Page
273	ABM Products	159
478	A.M. Electronics	138
314	A-Bargain Distributors	157
91	Aardvark Technical Services	46
51	ABEX	14
311	Ackerman Digital Systems, Inc.	68
473	Advanced Systems Concepts	142
39	Advanced Systems Concepts, Inc.	161
498	Adventure International	144
56	American Square Computers	70-71
187	Ancie Labs	87
486	Andent, Inc.	144
192	Apparat, Inc.	CIII
287	Ashton-Tate, Inc.	101
*	B.G. Micro	126
124	B.T. Enterprises	54
*	Back Issues	104
211	Bartleby's Software Service	23
131	Bay Technical Associates	55
247	Beeline Services	55
481	Bit 3 Computer Corp.	138
87	The Bottom Line	161
326	Bourbon Street Press	156
465	Bretford Manufacturing	137
484	Broderbund Software, Inc.	144
79	C & S Electronics Mart Ltd.	83
148	CDR Systems, Inc.	161
256	CPU Shop	110
370	CRC Publishing	79
398	Card Electronics	134
170	Chips & Dale	133
224	Columbia Micro Systems Inc.	133
490	Commodore Business Machines, Inc.	145
376	Communications Electronics	109
371	CompuServe	34
320	Computer Case Company	143
18	Computer Design Labs	85
384	Computer Mail Order	39
176	Computer Mart	141
110	Computers, Peripherals Unlimited	53
362	Computer Plus	104
36	Computer Shopper	21
227	Computers Wholesale	63
297	Concord Computer Products	122
292	Coosol, Inc.	135
346	Corsair Computer Corp.	159
252	Cuesta Systems	104
*	Cybernetics, Inc.	45
469	Cyborg Corp.	136
293	D & N Micro Products	44
199	D&W Digital	58
*	Daman	82
492	Dantek Software, Inc.	145
174	Data-X of Oregon	133
34	Dedicated Systems	157
24	Delmart	86
155	Digatek Corp.	161
466	Digicomp Research Corp.	136
*	Digital Research Computers	127-129
61	Digital Systems Engineering	23
250	Discount Software Group	41
300	E.A.P. Company	159
82	Ecosoft	44
254	Educational Microcomputer Systems	82
57	Educational Microcomputer Systems	133
169	Elcomp Publishing, Inc.	95
25	Electronics Center	111
93	Electronic Specialists, Inc.	54
*	Encyclopedia for the TRS-80*	
116	Escon Products, Inc.	25
464	Etronix	136
483	Eventide Clockworks Inc.	144
178	Expotek	34
488	Farmplan Computer Systems, Inc.	145
191	Floppy Disk Services	33
477	Franklin Computer Corp.	140
22	Gimix, Inc.	139
392	Golden West Computers, Inc.	58
6	H&E Computronics	93
*	Hanley Engineering	150
243	Happy Hands	8
482	Hewlett-Packard	138
487	Human Engineered Software	144
235	I.B. Computers	161
209	I.D.M.	82
279	IDPC	104
467	I.E. Technology Ltd.	136
493	INI,Inc.	145
138	Inmac	55
128	Innovative Technology	161
77	Integrand Research Corp.	76
3	Intertec Data Systems	9
84	J.D.R. Microdevices	112-113
180	J.E.S. Graphics	53
92	J.P.C. Products	57
284	J.R.T. Systems	144
48	Jade Computer Products	119-121
41	Jameco Electronics	124,125
164	Jimscot, Inc.	27
*	John Bell Engineering,Inc.	17
222	Kalglo Electronics	91
54	Key Software	154
198	LNW Research	48
355	Leading Edge Products	CIV
472	Leading Edge Products	142
78	Lifeboat Associates	141
373	Logical Devices, Inc.	53
489	MAC Software	145
316	MFJ Enterprises, Inc.	61
234	Magnolia Microsystems	159
72	Master Electronics, Inc.	143
165	Med Systems	97
*	Microcomputing Advertising	105
*	Microcomputing Binders	104
*	Microcomputing Book Nook	106-108, 146
*	Microcomputing Dealers	58
*	Microcomputing Subscription	67,105
308	Micro 80, Inc.	65
*	Micro Ink, Inc.	69
*	Micro Instructional, Inc.	3,35
100	Micro Management Systems	104
347	Micro Mint, Inc.	104, 155
68	Micro Resources Corp.	49
*	Micro Technical Products	25
154	Micro Technology Unlimited	15
144	Midwest Scientific Instrument	78,79
*	Mikos	115
255	Miller Microcomputer Service	158
238	Mini Micro Mart	43
494	Money Disk	145
*	Netronics R & D Ltd.	96
*	Netronics R & D Ltd.	123
485	New Generation Systems, Inc.	144
286	Nibble Magazine	51
480	Northwest Instrument Systems, Inc.	138
53	Okidata Corp.	5
310	Omni Resources	47
499	Omni Software Systems, Inc.	146
140	Omnitek Systems	37, 49
29	Optimal Technology, Inc.	155
130	Optronics Technology	133
474	Optronics Technology	140
172	Pacific Exchanges	95, 104, 159, 160
495	Paladin Systems	146
*	Percom Data Company, Inc.	CII
471	Percom Data Company, Inc.	142
475	Peripheral Products Group	140
266	Perry Oil & Gas	75
303	Personal Computer Systems	161
277	Priority One Electronics	116,117
202	Progressive Computing	23
479	Prometheus Products, Inc.	138
98	The Purchasing Agent	153
44	Quest Electronics	118
390	R.W. Electronics	62
101	Racet Computes Ltd.	49
102	Rand's, Inc.	66
*	Realty Software Co.	159
142	Riverbank Software	97
117	Saturn Systems	29
146	Scelbi Publications	38
205	Selectronics	114
375	Semi Disk Systems	151
*	Sinclair Research Ltd.	10,11
132	Sixty Eight Micro Journal	49
*	Snappware, Inc.	84
302	Software Connection	26
491	Software Publishing Corp.	145
294	Software Support	77
208	Southwestern Data Systems	19
217	Standard Software Corporation of America	143
237	States Computers	97
179	Stellation Two	103
497	Supersoft, Inc.	146
318	TNW Corporation	55
189	Tab Sales Co.	86
95	Technical Software Systems	25
65	Teletek Enterprises, Inc.	7
328	Texas Computer Systems	53
221	Total Access	89
476	University Data Systems	140
496	Voyager Software	146
158	Vynet Corp.	159
*	Wameco/Mikos	115
*	Wayne Green Books	105
*	Wayne Green International	132
163	Wintek Corporation	95
*	World Wide Media	104
114	X&Y Enterprise	134

For further information from our advertisers, please use the Reader Service card. ***This advertiser prefers to be contracted directly**

```
1 POKE565,254:POKE566,200:POKE567,208:POKE568,251:POKE569,230
2 POKE11,39:POKE12,2:POKE551,72:POKE552,162:POKE553,4:POKE554,160
3 POKE555,0:POKE556,132:POKE557,254:POKE558,169:POKE559,208
4 POKE560,133:POKE561,255:POKE562,169:POKE563,32:POKE564,145
6 POKE570,255:POKE571,202:POKE572,208:POKE573,246:POKE574,104
7 POKE575,96:GOSUB8:GOTO10
8 A=USR(B)
9 RETURN
```

Listing 3. Clear screen routine.

(letters from page 34)

executing print statements to scroll the screen. The routine (Listing 3) is easy to incorporate into your programs, and makes them look more professional when they run.

The routine is a machine-code program converted into POKE statements for use in Basic programs. How it works isn't important, so I'm not going to explain it. It's only necessary to know that to use the routine, execute a GOSUB 8 statement when you want the screen cleared. When your program executes a GOSUB 8 statement it will branch to the function in line 8 (A=USR(B)). The function in line 8 branches to the machine-code program and clears the screen, then returns to the Basic program and continues at the statement following the GOSUB 8.

You can use the routine as a utility of sorts by saving it on tape. Then, before entering a program you're writing, load the routine so it becomes part of your program. The routine can also be inserted into previously written programs if they don't start before line 10.

You can execute this routine in the immediate mode too. This is very handy when you're working on a program and want the screen cleared. Just type in GOSUB 8 and the screen will clear.

Charles Emerson-Henry
Minneapolis, MN

Micro-Courier Defended

Microcom has several serious objections with Mr. Frank Derfler's review of Micro-Courier in the Dial-Up Directory section of January's *Microcomputing* (p.14). These objections fall into three categories—errors, omissions and overall approach.

Most importantly, Mr. Derfler incorrectly states that Micro-Courier requires some quality control check on transmissions. In fact, however, the Micro-Courier protocol ensures reliable and error-free transmission and is considered state-of-the-art within the field of microcomputer communications. The Micro-Courier protocol includes error detection and recovery mechanisms. Error detection mechanisms employ both a character parity check and a block checksum. Micro-Courier will retransmit on detection of error.

Mr. Derfler omits an important Micro-Courier feature—the ability to transmit any Apple DOS 3.3 file *including binary files*. This permits users to transmit charts and graphs by VisiPlot, for example, or other binary programs and files. Again, the Micro-Courier protocol ensures reliable and error-free communication.

Gregor N. Ferguson
Software Product Manager
Microcom, Inc.
Norwood, MA

According to Frank Derfler, Jr. (January 1981, Dial-Up Directory, p. 14), Microcom's software package, Micro-Courier, is lacking in many standard error checking routines to insure 100 percent correct transmission. Our experience in using this package in a work environment has not proven this true. In the nine months we have been using this package, we have had no problems in this area. We have found the package easy to use.

We recommend it as a software package which fits into a business environment.

Ronald E. Burr
Catalog Controller's Dept.
J.C. Penny Company, Inc.
Milwaukee, WI

The ZX81 Kit

After 61 issues I have finally gotten my feet wet with a Sinclair ZX81 kit. I have successfully completed my kit but not without some problems. Those who are considering building kits might appreciate some help.

I purchased my kit in late November and it arrived mid-December. All the parts were there except the transfer switch. I assembled it in about four hours during which time I had to remove the resistor networks RP1 and RP3 that I had installed backwards. When I applied power nothing happened. My unit came with some extra components that turned out to be part of the input power rf filter (I1, I2 and C13) which do not show up on the parts list or the schematic. After installing I1, I2 and C13 (they were marked on the PC board, near the regulator) the TV screen was synching but the picture was oddly patterned. I traced through the circuit using the schematic and found that R3 had a 2.2k resistor and R6 had none on the PC board. I had used the parts list to assemble the parts and it incorrectly calls out R3 and R6. R6 should be 2.2k and R3 is not used. I also found that R15 was listed as 1k in the parts list but should be 220k as shown on the schematic (it is part of the Z-80A chip's power-on-reset).

Once I corrected these omissions and errors the system ran properly. My only problem now is that the power plug easily unplugs from the unit causing the loss of the program. I will eventually provide either a battery backup (0.5 to 1 amp at 9 V dc) or hardwire the input plug and install an on/off switch in the line.

I have had limited use so far but the 8K Basic is easy to use and the single stroke commands are easy to adapt to. I expect I'll shell out another $100 for the 16K memory as soon as I generate programs that exceed the 1K RAM that comes with the ZX81.

David L. Rogers
Goleta, CA

Please see our review of the ZX81 on page 80.—Eds.

Expand Your Horizon

I want to express my appreciation to the readers who wrote concerning my article, "Expand Your Horizon" (*Microcomputing*, Jan. 1982, p. 118). I also want to thank Brad Kohn of Irvington High School and John Smith of the Computer Shoppe for their thoughtful suggestions.

Some issues were raised which require further clarification. To use the provided programs your system must have at least 24K RAM starting at address zero, be running DOS 5.2DQ with origin 100 hexadecimal and execute Z-80 code. Consequently, prospective users with single-density systems or those using an 8080 CPU must modify the machine-language subroutines.

I also want to mention an inexpensive third solution to the connection problem. A NSCOM user could dedicate the second serial port to communication by rewiring the configuration header as described in North Star's manual, "HRZ-D" p. 72.

An enhanced version of NSCOM is available from the Computer Shoppe. If interested check their advertisement.

Patrick Corry
Shirley, NY

Medical and Dental Software

In your Nov. editorial (Editor's Notes, p. 6) you say: "There seems to be little commercially available microcomputer software to aid the health-care professional in this area." Not quite true. We have been specializing in medical and dental software for a number of years on larger machines. In 1979 we turned our attention to microcomputers and wrote

MEDIC80 to run under the CP/M and MP/M operating systems. This package brought our considerable experience to the microcomputer user. MEDIC80A and DENTAL80A are now being installed. Both packages contain additional enhancements suggested by the doctors and dentists using the software.

Both packages contain medical note files to help the doctor or dentist keep a medical treatment record. During the last year we have also gotten into nutritional analysis by working with some of the country's leading authorities in this field. A nutrition package will be available as an option later this year.

Our software is sold to the end-user through distributors and dealers in many major (and some minor) cities in the United States and Canada. Recently we merged with our California distributor so our products are now being marketed under the MEDCOM name.

Ron Tipton
The Systems Shoppe
PO Box 227
Greenwood, MO 64034

Flexible, Portable MUMPS

I was most pleased to see an article on MUMPS in your February issue ("Is MUMPS the Cure?" Richard Walters, p.54). MUMPS has been overlooked in this country although it is used much more extensively in Europe and Japan. It is probably the best choice for an interactive business type program requiring flexible databases.

Because its database and I/O structures are included in its ANSI standard specifications, MUMPS is truly portable. Standard MUMPS is run on hardware as diverse as DEC (PDP-11 and VAX), TANDAM, AMDAHL (under UNIX), and Data General (NOVAS and ECLIPSES) as well as the micros mentioned in Walter's article.

COMP Consultants is a provider of both single and multiuser MUMPS systems utilizing a Motorola 6809 CPU on hardware including TANO Outpost-11, GIMIX, Commodore SuperPet, Hazelwood and Southwest Technical Products.

Your February issue incorrectly listed our address. It should be COMP Consultants, Inc., 6910 Fannin, Suite 307N, Houston, TX 77030. 713-790-0497.

David B. Brown, President
COMP Consultants, Inc.
Houston, TX

Osborne Revisited

As a serious user of the new Osborne computer, I invite other owners to join in forming a user's group for mutually beneficial information exchange. I am located in northern San Diego county near the Orange county border and would be happy to hear from Osborne owners in this part of the country.

My personal interests are heavily into security analysis, both technical and fundamental, and I am finding the SuperCalc spreadsheet to be of major assistance in my work. I would be happy to exchange information on this subject with other investors regardless of their location.

My Osborne has proven to be convenient, productive and trouble-free. My one complaint to date (and I understand that it is a general problem in the industry) is the quality and quantity of the manufacturer-supplied documentation. An active organization of Osborne users should help to fill this deficiency.

As an initial contribution to forming one or more user's groups I will undertake to send a progress report to everyone who sends me a stamped, addressed envelope. Let's hear from you out there.

R.B. Gordon
276-167 N. El Camino Real
Oceanside, CA 92054

I noted with interest the letter from Mr. Moyer on Osborne (Letters to the Editor, Nov. 1981, p.211). I recently purchased an Osborne 1 and I must say I had quite the

Send Your Business To Europe Via Wayne Green International

You can introduce your products to the European market without leaving your office. All you need is a phone and the best advertising liaison between here and Europe—Wayne Green International. We represent four of the largest microcomputing magazines in Europe that will help you introduce and make your product known in the European market.

MICRO DIGEST

MICRO DIGEST is the newest resource for American businessmen to rely on for the best exposure overseas. The first publication of its kind, MICRO DIGEST caters to dealers, reps, OEMs and importers of micro and mini products. MD is the organ of the European Microcomputer Publishers Association (EMPA), publishers of the four largest computing magazines on the continent. MICRO DIGEST is published in English, French, German and Italian, and reaches a market of 312 million people. Make MICRO DIGEST your best ally in the European micro market.

CHIP

The German-speaking market has an exceptional sales potential. CHIP, the leading German magazine for desktop computers, will help you to make this market your own. Over 65% of the CHIP readership deals with computers in their business or profession. With its reputation for excellence and a paid circulation of 62,913*, CHIP is your direct line to the German microcomputer market.

*IVW Auditing (ABC Equivalent), 2nd quarter, 1981

MICRO & PERSONAL COMPUTER

MICRO & PERSONAL COMPUTER, the most sophisticated microcomputer magazine in the world, is the ideal media for introducing and marketing computer products in the Italian market today.

WAYNE GREEN INTERNATIONAL
The European Micro-Media Specialists
Peterborough, N.H. 03458 (603) 924-7138

To receive further information on these magazines, write or call:

Piergiorgio Saluti
Wayne Green International
Peterborough, New Hampshire 03458
(603) 924-7138

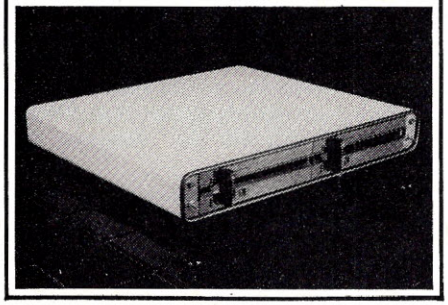
THIN is IN!

State-of-the-art 8" disk drive subsystems give you a remarkable 2.4 MB in the space of a single-drive cabinet. Our 4-drive unit gives you an astounding 4.8MB storage capacity in the space of a 2-drive cabinet. Perfect add-ons for IBM, Apple, Radio Shack and all 8" Shugart compatible computers.

Check our low prices and contact us for more information.

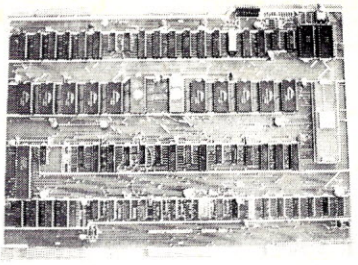
2-Drive — $1695, 4-Drive — $2995,
2-Drive Horizontal — $1750,
write protect switch option - $30/drive

Columbia microSystems, Inc.
905 E. Broadway ↙224
Columbia, MO 65201
(314) 443-0255



NEW! M-68000

SINGLE BOARD COMPUTER



FEATURES:
16 bit Motorola 68000 CPU operating & 10MHz, 20K bytes of on board fast static RAM, 16K bytes of on board EPROM space, 7 levels of prioritied autovectored interrupts, 2 memory expansion buses (up to 256K), 2 serial communication ports (RS-232C), 16-bit bidirectional parallel port, 6800 peripheral accomodation bus, 5x16-bit counter / timers with vectored interrupts, on board real time clock, software compatible with Motorola MEX-68KDM board.

PRICE:

Bare board with documentation	$99.95
MEX68KDM compatible monitor in 2764 EPROM's	$120.00
M68000 CPU & memory map PROM	$115.00
Shipping and handling (Domestic)	$3.00
(Foreign)	$15.00

CALIFORNIA RESIDENTS ADD 6% TAX

EMS Educational Microcomputer Systems ↙57
P.O. BOX 16115 IRVINE, CA. 92713-6115

CHIPS & DALE

Specializing in memory Chips

THE INFLATION FIGHTERS!

Please note: software now available for CPM® and other select computers such as Apple® and Pet®.

Z80A CPU $5.50
8251A $4.75
1791 Controller $23.00

—RAM—

4116 300ns 8/**$11.00**
4116 250ns 8/**$12.00**
4116 200ns 8/**$13.00**
4116 150ns 8/**$16.00**
2114L 300ns 8/**$16.00**
2114L 200ns 8/**$17.25**
4164 200ns **$7.90**
6116 2K-8 BIT 150ns **$8.00**

— EPROM —

2716 (5v)450ns 8/ **$3.75** ea. **$4.15** ea.
2716-1 (5v)350ns **$7.50** ea.
2732 (5v)450ns 8/ **$7.25** ea. **$9.00**
2532 (5v)450ns 8/ **$9.75** ea. **$10.25**

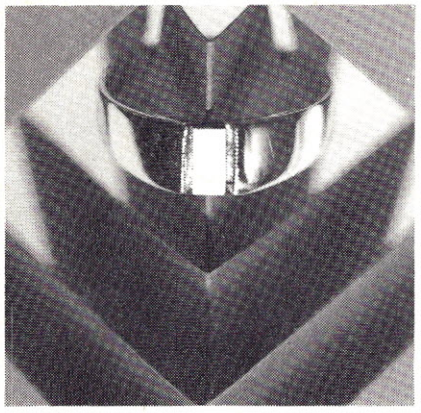
NEW Products Coming
Very Low Prices
Printers—Epson, Okidata, Paper Tiger & others
Terminals—Televideo's, Z-19's, Z-89's & others
Please call or write for other computer peripherals

Call for quantity pricing
Call or write for Catalog
Please allow up to 3 wks. for Personal checks to clear
Master charge
VISA accepted.

Add $3.50 Shipping & Handling
Wash. residents add 6.6% Sales Tax
Prices subject to change without notice

CHIPS & DALE ↙170
P.O. BOX 31607, DEPT M
Seattle, Washington
Zip 98103
1-206-524-9126

CHIPS & DALE
Specializing in memory Chips



The Computer Chip Keepsake©

$59.95 Gold plated over silver
$119.95 14kt Gold

The advent of the first microprocessor memory chip changed the future of modern electronics.

In tribute to the "Silicon Age" we present the Computer Chip Keepsake – an actual silicon chip delicately set in a 14K gold ring-fit to exact ring sizes.

Guaranteed delivery in 2 weeks
Visa – Mastercharge accepted
Please indicate ring size

Designed by:
DATA-X
3304 NE 45th
Portland, Ore. 97213
(503)287-5436
↙174
Satisfaction Guaranteed

IS YOUR DISK DRIVE WORKING OVERTIME WITH ONLY MEDIA WEAR TO SHOW FOR IT ?

Your floppy drive rotates disks constantly, grinding dirt into the delicate surface which contributes to shortened media life while generating unnecessary noise.

Our Drive Control Unit energizes the drive only when disk access is absolutely necessary. Media lasts longer and the system is quiet. During drive access, the motor is energized at zero-crossings and will turn itself off after nine seconds of idle time (adjustable.)

D.C.U. is designed to be easily installed onto all popular 8 inch drives within a few minutes by plugging into the drive in series with the A.C. input. In most cases, no modifications are required to your system. Please state type of drives and controller used on your order.

DCU is available in kit form for $18.95, or assembled $29.95.

OPTRONICS TECHNOLOGY 716-377 0369 ↙130
PO BOX 81
PITTSFORD NY 14534

TERMS: Include $1.50 for postage/handling. NYS residents add tax. C.O.D., Check, or money order

↙See List of Advertisers on page 130

reverse treatment. I purchased the unit through a Xerox store and received nothing but the best of assistance, information, etc. The price was exactly as stated at $1795 plus tax for the unit plus all advertised software/manuals. Then, upon sending the end user agreements to Osborne's main offices, I quickly received additional information plus notes on bugs, future offerings in the way of upgrading, i.e., dual-density drives, modem, improved keyboard, etc., with the promise of a future listing of approved software. All in all I am not only very pleased with the unit but with the association with Osborne and my particular dealer. So Mr. Moyer, it would appear that you were unfortunate in your selection of dealers and you have my sympathy. Please don't give up on Osborne!

E.A. Flynn
Mesquite, TX

Oops!

While reading "Sorting Techniques Explained" by H.S. Gentry (Nov. 1981, p.156) I encountered an obvious error in the paragraph just before the conclusion (p.160): "This change makes the algorithm about 8 percent faster with 500 elements to be sorted and almost 14 percent faster with 500 elements."

I'm not sure what numbers should be there, but if you are comparing execution time for X and Y number of elements, may I suggest that either one of those 500s should be a smaller number or else something is missing such as a greater than or less than statement.

J.P. Yerger
Hyde Park, MA

You're right—you've spotted the editor's nemesis, the typographical error. The sentence should read "This change makes the algorithm about 8 percent faster with 200 elements to be sorted and almost 14 percent faster with 500 elements." Thank you for your attentive reading. We apologize for any confusion this may have caused.—Eds.

IBM PC Hardware And Software

I am in the process of developing a database of software and hardware for the IBM Personal Computer. I plan to publish two monthly listings: one will list the new additions and the other will list all the software and hardware available to that date. The listings could be obtained at nominal charges from the address given below. At this moment I have about 55 items in my list and hope it would grow soon.

The listings would have two parts—one part will cover the hardware available for the system and the second part will cover the software available in all the areas. The list will be indexed by the title and source. Classification of the product, name of the product, product description, configuration required, available form, price, source and other necessary information will be included in the listings.

Interested parties developing hardware or software should write as soon as possible to include their product in the list. Persons looking for available hardware and software should also write for more information to: Sapana Micro Software, PO Box 748, Quincy, IL 62301.

Kailash Chandra
Quincy, IL

Build Your Own Micro

An article "Build Your Own Micro" was printed in the September 1980 issue of *Microcomputing* (p. 62).

Is there anyone who has built it and implemented an RS-232 device on it? The outfit I bought the micro from could not help me or give me the listings of the monitor.

Tom Milutin
Newton, MA

Don't Give Up!

I have just finished reading your editorials in the November 1981 issue of your publication and decided I must respond. The subject that has prompted me to write is the content matter in *Microcomputing*.

First of all I should explain who I am. I am a businessman in the airline industry, in upper-level management and do not have access to a business computer. I am in my upper fifties with only three years of college. I obtained my first computer in June 1978 (a TRS-80 Model I) and upgraded to a TRS-80 Model III in December 1980. I use my computer strictly at home for personal education and enjoyment. My principal interests are home and household applications, personal finances and miscellaneous other useful applications. I do not spend time on games. I generally only have time for my computer on weekends.

Gaining the knowledge of how to use my computer efficiently is one of my biggest problems. Finding time to study the many confusing textbooks is a further problem, and I find that most textbooks are extremely confusing and generally do not tell me the basic things I need to know. I do not care about the knowledge necessary to write long and complicated programs. I need to know more about basic application, error correcting and how to make a program do what I want it to do.

Among the many computer publications that I subscribe to I generally look only for those article and programs that address themselves to the TRS-80 and the Basic language. Generally speaking, your publication along with *Creative Computing, Popular Computing, Byte,* and *Personal Computing* are not specific enough for me and cover too many articles and programs on equipment that I cannot use. I am not at all interested in Apple, PET or IBM.

I would like to see more tutorials aimed at the beginner, like me. Why hasn't someone written articles, or a book, on converting one Basic dialect to another? I have seen many excellent programs developed for other computers but do not know how to modify them for my TRS-80. Perhaps authors should be encouraged to give the necessary modifications along with their programs.

The sum and substance of this letter is if you stray away from TRS-80 programs, articles and applications, dumbbells like me will lose interest in your otherwise fine magazine.

Eric Norton
Oklahoma City, OK

INTELLIGENT PLOTTER
INEXPENSIVE COST
PRINTER
$600.UP
Z FORM PLOTTING
UNIVERSAL-232,488
DRAFTING QUALITY COLOR INK PLOTTING
TECHNICAL SPECIFICATIONS:
RESOLUTION: .005"/step
PLOT SPEED: 2.0"/sec. standard, higher speeds optional
PRINT SPEED: typically 1.5 character-per-second (1/8" character), slower for larger characters
PENS USED: Razor fiber tip, ball point or ink, (8 fiber tip pens furnished, PILOT razor type)
REPEATABILITY: ± .0025". Really! Errors don't accumulate with our stepping motor design
PLOT WIDTH: 15" with offscale tracking and beep alert.
PLOT LENGTH: 27.3 feet
PAPER USED: Standard sprocket feed printer paper. Z fold or roll. (Samples furnished)
GRAPHICS SOFTWARE
SEND-CALL FOR LIT.
205 854 0177
X AND Y ENTERPRISES ✓114
Dept. K
Box 796 Huntsville, ALA. 35804

COMPUTER I/O SYSTEMS
1. SOLID STATE SWITCH-4V to 10VDC control input (TTL compatible). The devices will control 120 VAC @ 2.5A.
SS-4/A-Z (Zero crossing-low noise generation) $12.95
SS-4/A (phase control type) $12.95
2. DC SOLID STATE SWITCH-4V to 10 VDC control input (TTL compatible). The devices will switch negative or ground voltage to a 4A or 8A load connected to 3VDC - 50 VDC
NDC-1/4 (4A specify 3V-15V or 15V-30V) ..... $ 9.00
NDC-1/8 (8A specify 3V-15V or 15V-30V) ..... $ 9.95
3. LINE VOLTAGE SENSE - Module will detect presence of an AC or DC voltage. Then signal the interface with a ground or logical low.
LS-1 ..... $ 9.95
4. MOTHER BOARDS - 2 and 4 slot mother board with fused outputs, accept above modules.
MB-2 (2 slot) ..... $ 9.50
MB-4 (4 slot) $18.50
5. SERIAL TO PARALLEL RS-232 INTERFACE-Plug into RS-232 port of your computer. Connect mother boards to 10-S. Then control 24 output devices and 32 input devices.
IO-S (serial RS-232 to parallel, control and sense)
KIT $149 ..... A&T $179.
6. IO INTERFACE TO TRS-80* EXPANSION BUS control 24 output devices, sense 32 inputs
IO-RS (TRS-80* expansion bus to cardtronic devices)
KIT $99 ..... A&T $149.
C-80 (IO-RS to TRS-80*, 40 conn. 24" cable) $16.95
C-232(IO-S to RS-232, 18" cable) $18.95
C-8 (8 conn. cable 24") ..... $ 5.95
C-14 (14 conn. cable 24") ..... $ 5.95
CARD ELECTRONICS ✓398
P.O. BOX 3514, AUGUSTA, GA 30904
(404) 860-8429
Georgia residents add 4% sales tax
VISA AND MASTER CHARGE
Add $3.00 shipping and handling
*Trademark of Tandy Corporation

You seem like a prime candidate for two of our sister publications—Desktop Computing *(the plain language computer magazine for the businessman)* and 80 Microcomputing *(the magazine for TRS-80 users). We are sending you subscription information and sample copies of these magazines.—Eds.*

CP/M Version of Touch Typist

I would like to thank *Microcomputing* for publishing J.C. Hassall's well-written review of Touch Typist (Jan. 1982, p. 203). Mr. Hassall reviewed the Heath HDOS version of the program. An identical CP/M 2.0 version is also available. Each program sells for $29.95 and can be purchased direct from Newline Software or from any Heathkit Electronic Center. The HDOS version requires the H8/H19 or H/Z89 computer. The CP/M version requires the H8/H19 or H/Z89 or 8080/Z80 with the H19 terminal. Both versions require 24K of memory. Heathkit computer owners are invited to send requests for information on other software products to Newline Software.

Ron Rocheleau
Newline Software
PO Box 402
Littleton, MA 01460

HELP!

I'm having a problem with my computer system that others may be experiencing too.

I have an Apple II Plus and an Epson MX-100 printer with a Tymac parallel interface card. The problem is with the flash command. An example will show the problem better. Run the following program to generate the full character set to the MX-100:

```
10 for I = 32 to 127
20 Print CHR$ (I);
30 Next I
```

No problem! Now change the program to read:

```
10 for I =32 to 127
20 Flash: Print CHR$ (I);
30 Next I
40 Normal
```

What happens is that most symbols and all numbers print out in lowercase letters.

When I had an MX-80F/T (without Graftrax), there was no problem. There is also no problem with the inverse command.

But, keeping all things constant (the Apple II Plus, the Tymac card and the printer), the only change from the MX-80 to the MX-100 is the addition of the Epson Graftrax PROMs.

Epson says it's the Apple; Apple says it's the Epson PROM; everyone says it's not the Tymac card.

HELP! Does anyone have an answer?

S. Richard Ravich
Vice President Marketing
AKG Acoustics, Inc.
77 Selleck St.
Stamford, CT 06902

Your Basic Identity Crisis

According to the dictionary, the word "basic"—whether used as a noun or as an adjective—refers to something fundamental.

To the computer breed, BASIC has a specific meaning; it refers to a language, admittedly with many dialects, but still a language.

Your decision (As the Word Turns, March 1982, p.176) to demote BASIC to Basic can lead to a frustrating lack of understanding on the part of your readers. There will often be the need to stop and consider whether the standard English word or the name of a computer language is meant.

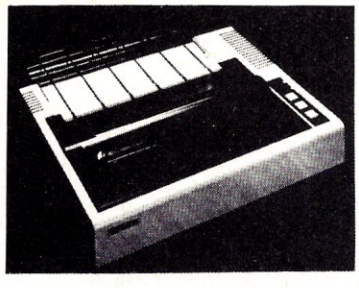
Please restore BASIC to its own dignity and identity.

Lyla Brumbaugh
Florham Park, NJ

No.—Eds.

COOSOL DISCOUNTS

PRINTERS



- EPSON MX70 ..... CALL
- EPSON MX80 ..... CALL
- EPSON MX80 F/T ..... CALL
- EPSON MX 100 ..... CALL
- NEC PC-8023A-C $555
- ANACOM ANC150P OR S $1195
- ANACOM ANC160P OR S $1465
- TALLY MT-1602 OR 5 ..... $1495
- TALLY MT-1802 OR 5 ..... $1795
- NEC 3510-1, 3515-1, 3530-1 .... $1795
- NEC 7710-1, 7715-1, 7730-1 .... $2495
- NEC 7720-1, 7725-1 ..... $2995
- C.ITOH FP 1500 25PU, H, OR Q $1350
- C.ITOH FP 1500 25RU $1450
- C.ITOH FP 1500 45PU OR Q ... $1795
- C.ITOH FP 1500 45RU $1995
- HP-PRINTERS ..... $ CALL

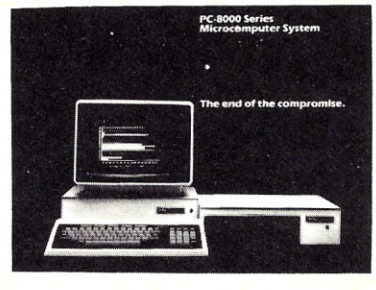
HEWLETT PACKARD

- HP-125 Microcomputer $2995
- HP-85A Microcomputer $2195
- HP-83A Microcomputer $1595
- HP 85/83 16K Memory Module .. $169
- HP7225B Graphics Plotter $1959
- HP-5 ¼" Dual Disk Drive $1995
- HP-5 ¼ Single Disk Drive $1249
- HP 8" Dual Disk Drive $5395
- HP-Other Mass Storage Units .. CALL
- HP-9111A Graphics Tablet $1595
- HP Firmware ..... CALL
- HP Software Packages ..... CALL
- HP Interfaces ..... CALL

OTHER COMPUTERS

- ALTOS MTU/Floppy/Harddisk . CALL
- ADDS Computer Systems ..... CALL
- ATARI Computer and Accessories ..... CALL

NEC COMPUTER



- NEC Computer PC-8001A ..... CALL
- NEC I/O Unit PC-8012A ..... CALL
- NEC I/O Port PC-8033A ..... CALL
- NEC Disk Drive PC-8031A ..... CALL
- NEC Disk Drive PC-8032A ..... CALL
- NEC Dot Printer PC-8023A-C .. CALL
- NEC GR Monitor JB-1201 ..... CALL
- NEC COL Monitor JC-1202 .... CALL
- NEC Accessories & Software ... CALL

TELEVIDEO TERMINALS

- 910C $595
- 920C $750
- 912C $705
- 950C $959
- ADDS Viewpoint WB2101 or WB2102 ..... $595

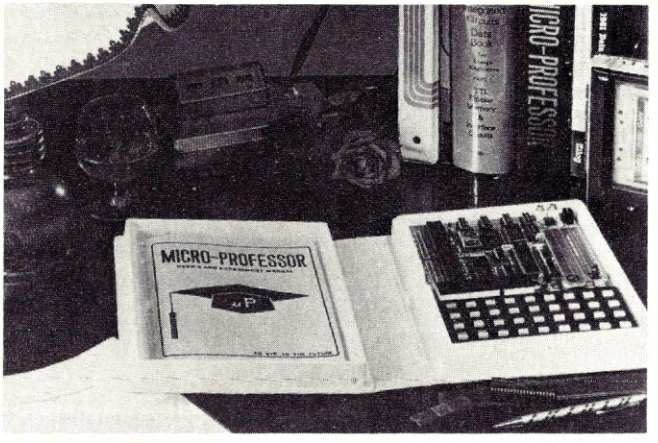
Calif.(714) 545-2216 (800) 854-8498

COOSOL, INC. P.O. BOX 743, ANAHEIM, CALIFORNIA 92805-0743 ↙292

↙See List of Advertisers on page 130

Edited by Linda Stephenson

Experiment with ISAAC/Apple Mods Sixteen Bits Speed Up the Action Made for Ada



The Micro-Professor from Etronix.

Electronic Teaching Tool

The Micro-Professor is a Z-80-based microprocessor learning system designed for personal use. The unit comes with a six-digit LED display, 2K bytes of ROM (expandable to 8K), 2K bytes of RAM, 24 I/O lines, 2K bytes of monitor, audio cassette interface, counter timer circuits, user wire-wrap area, 36-key keyboard, 9 V power adapter and extension connectors to provide all expansion signals. The system is expandable with Z-80-CTC, Z-80-P10 and an EPROM board programmer. The price is $129.95.

Etronix, 14803 N.E. 40th, Redmond, WA 98052. Reader Service number 464.

Expanded System

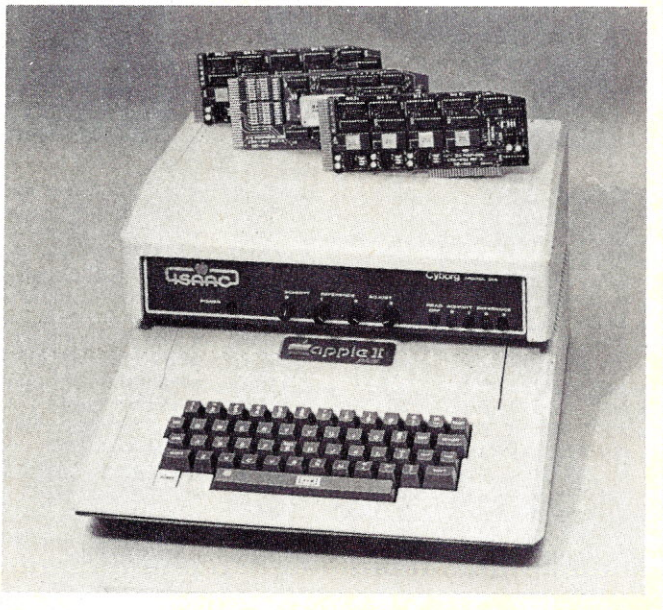
The Cyborg Corp., 55 Chapel St., Newton, MA 02158, has announced three plug-in expansion modules for additional input-output channels on its Apple-based data acquisition and control system. The ISAAC/Apple system was introduced last fall in a standard configuration that included 16 analog inputs, four analog outputs, 16 binary inputs and 16 binary outputs—plus timer, counter, real-time clock, four Schmitt triggers and LabSoft. The new expansion modules allow significant channel expansion for process control, electronic test and energy management.

The ADC expansion module, priced at $850, offers 16 additional analog input channels, with 12-bit analog to digital conversion. The D/A module offers four analog output channels for $725; it consists of four discrete digital to analog converters. The binary module allows 16 binary inputs and 16 binary outputs. It operates with a latching 16-bit I/O data bus with full handshaking; price is $325. Reader Service number 469.

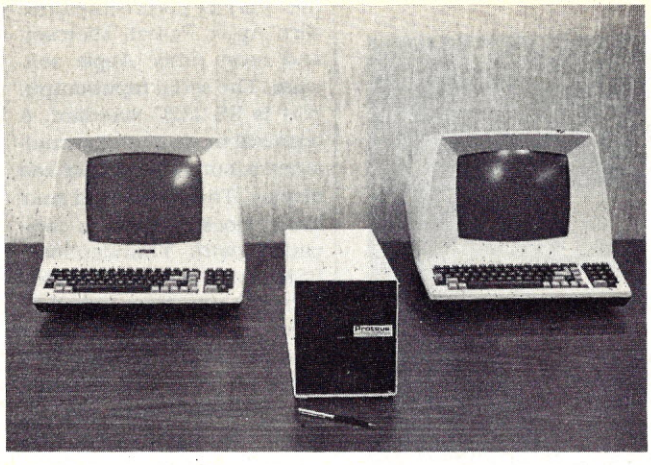
Sixteen Bits

Innovative Electronics Technology Ltd., 6993 A Antrim Ave., Burnaby, B.C. V5J 4M5, Canada, offers its 16-bit Z8001 single-board microcomputer, Proteus. This modular system is easily upgraded to a full multi-user system capable of handling up to 510 users with true distributed processing and no degradation in individual performance. The CPU board contains a 4 MHz Z8001, two serial ports and a real-time clock. The board also contains 128K bytes of dynamic RAM for user memory, 8K of static RAM for system memory, and 16K of ROM containing the two-user BITOS operating system. Benchmarks written in Microsoft Basic run up to ten times faster than identical programs running on a 4 MHz Z-80. All I/O is interrupt-driven, and a 9511/12 floating point processor is optional. Proteus was designed to mount on the side of a 5¼-inch Winchester hard disk; this allows up to 256 Proteus modules to be linked through a BIBUS controller card. The basic Proteus unit, which includes a 5¼-inch floppy drive, is priced at $4860, U.S. Reader Service number 467.

Delphi-100, a dual-proces-



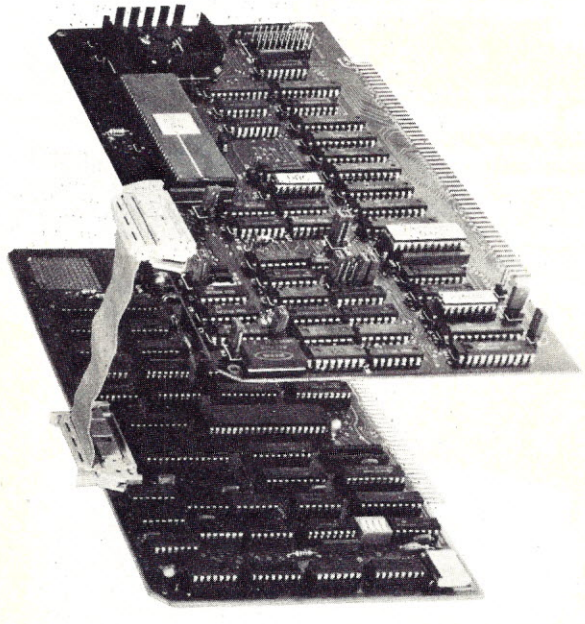
Three new expansion modules for the ISAAC/Apple system are available from Cyborg.



I.E. Technology's Proteus microcomputer, shown here with terminals for a simple two-user configuration.

sor S-100 system, is based on the 16-bit MC68000 CPU and eight-bit Z-80 CPU, with software-controlled switching between them. This arrangement gives Delphi-100 the software and hardware advantages of the new generation of CPUs, while retaining compatibility with old peripherals and programs. Delphi-100 is tailored to run Ada, the language developed by the U.S. Defense Department. Delphi-100 also supports a multitasking Pascal and all 8080 and Z-80 software, including CP/M. Multitasking languages Ada and Pascal are available on Delphi-100 with the TeleSoft ROS-Ada operating system. The TeleSoft Ada compiler approaches a complete implementation of Ada; it checks syntax for the entire Ada language and generates code for all but the most complex features.

Digicomp Research Corp., Terrace Hill, Ithaca, NY 14850. Reader Service number 466.

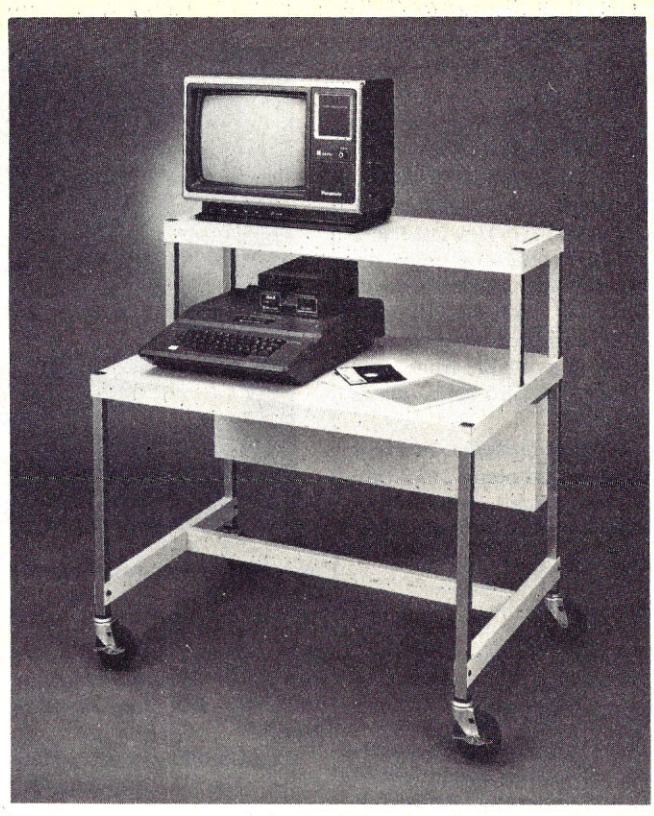


Digicomp Research Corp. has introduced the Delphi-100 dual-processor system.

Safe, Sturdy Mobility

The EC10 microcomputer table was designed specifically for school and training purposes. The unit offers clean styling, easy adjustability and safe mobility. It features an adjustable top shelf and work surface, a slotted top shelf for safely securing a monitor or other equipment in place, a cord organizer/modesty panel for keeping loose cords and connectors off the floor and out of the way, and an ES unit comprising three outlets, a 20-foot, three-wire cord and grounded plug. The EC10 is made of heavy gauge steel, and has four-inch casters (two with locking brakes) and six square feet of work surface. Standard 27-inch typing-height work surface can be lowered for children.

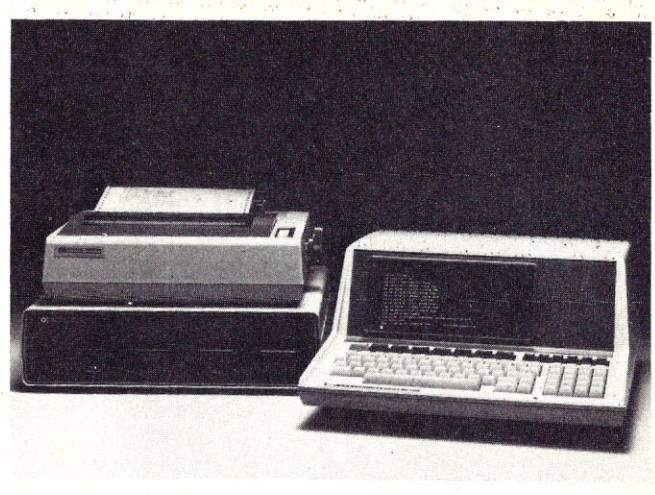
Bretford Manufacturing, 9715 Soreng Ave., Schiller Park, IL 60176. Reader Service number 465.



The EC10 microcomputer table from Bretford Manufacturing.

Expandable HP System

A new microcomputer from Hewlett-Packard features an



The HP-87 from Hewlett-Packard is supported by a full range of peripherals, including the HP 82901M dual disk drive and HP 82905B printer.

integrated high-resolution, 80-column, text-and-graphics display, enhanced HP Basic programming language and expanded software support. The HP-87's 32K-byte memory can be expanded to 544K. A plug-in CP/M system is available. All of Hewlett-Packard's personal computer peripherals are compatible with the HP-87, including the new 7470 graphics plotter. The HP-87 is available from local Hewlett-Packard sales offices for $2495.

Inquiries Manager, Hewlett-Packard Company, 1820 Embarcadero Road, Palo Alto, CA 94303. Reader Service number 482.

Northwest Instrument Systems' Model 85 oscilloscope module.

Two-Port Serial I/O Card

The Dual-Comm Plus adds two fully independent serial I/O interfaces to an Apple II. It combines the features of the Apple high-speed serial card and Apple communications card in one plug-in card with handshaking. Thumbwheel switches select the Apple slot locations. Sixteen switch-selectable data rates for each port range from 50 to 19,200 bits per second. On-board firmware provides extensive printer and upper/lowercase terminal/modem support. Dual-Comm Plus works with the standard Apple 40-column display or with an 80-column card. It can be programmed for asynchronous, synchronous or SDLC operation. The card supports interrupts. The design is based on the Z-80 SIO chip. Price is $239.

Bit 3 Computer Corp., 8120 Penn Ave. S., Minneapolis, MN 55431. Reader Service number 481.

Apple-Compatible Instrument

A dual-channel, DC to 50 MHz digital memory oscilloscope module is available from Northwest Instrument Systems, Inc., PO Box 1309, Beaverton, OR 97075. Their Model 85 uses the display and keyboard as an oscilloscope screen and control panel, the Apple computer for waveform processing, and disk memory for waveform storage. It performs standard laboratory functions such as signal averaging and DVM readout; 8K of Apple memory is available for user program development. Users can program the oscilloscope in Basic or machine language for functions such as Fast Fourier Transform, auto- and cross-correlation, power density spectra, and integration and differentiation. Using a fast sampling technique, the Model 85 acquires data through probes or cables connected to the module at the back of the computer. Fastest sweep speed is 10 ns/div, and, at 1 ms/div and slower, the scope operates as a real-time A/D conversion system. Price is $995. Reader Service number 480.

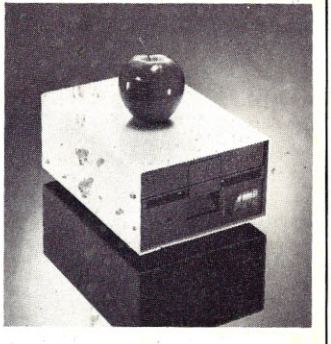
Four Cards on One

Versacard includes a serial I/O interface, parallel output interface, clock/calendar and BSR control on one card. The unique circuit design lets the Apple II "think" that separate cards are installed, making the interface ports compatible with Apple Pascal, Microsoft and most other Apple software. The serial input/output port is RS-232C standard. A terminal mode permits simultaneous output to printer and display. The one-second resolution clock/calendar is compatible with Thunderclock. BSR control requires the addition of an ultrasonic transducer for use with the X-10 Home Control System. On-board firmware provides optional auto line feed, video, paging, lower- to uppercase, and eighth-bit set on clear. Price is $249.

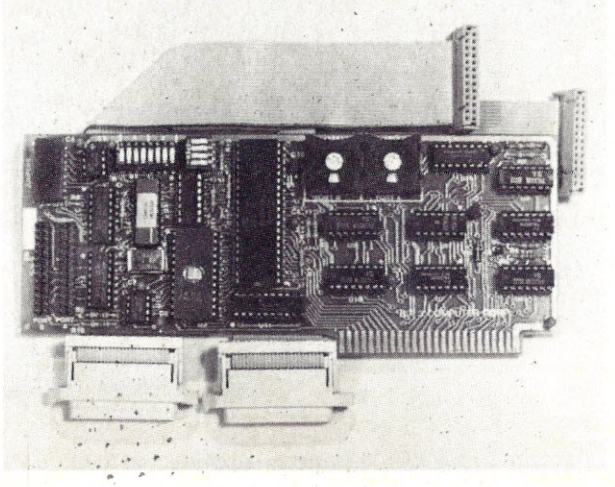
Prometheus Products, Inc., 45277 Fremont Blvd., Fremont, CA 94538. Reader Service number 479.

Disk Storage for Apples

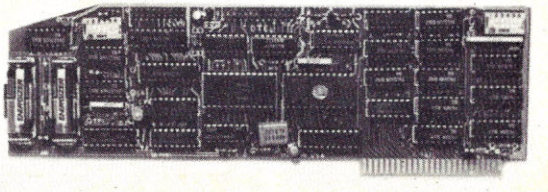
A.M. Electronics, Inc., 3446 Washtenaw Ave., Ann Arbor, MI 48104, has announced its 5¼-inch disk drive for Apple computer systems. Its beige case matches the Apple's. The 40-track drive is $395; an 80-track version is priced at $495. Reader Service number 478.



A.M. Electronics' Apple-compatible disk drive.



Dual-Comm Plus I/O from Bit 3.



The Versacard from Prometheus Products, Inc.

JUDGE THE REST, THEN BUY THE BEST

Only GIMIX offers you **SOFTWARE SWITCHING** between **MICROWARE's OS-9** and **TSC's FLEX**. Plus you get the power of the GMXBUG system monitor with its advanced debugging utility, and memory manipulation routines. A wide variety of languages and other software is available for these two predominant 6809 Disk Operating Systems.

You can order a system to meet your needs, or select from the 6809 Systems featured below.

JUDGE THE FEATURES AND QUALITY OF GIMIX 6809 SYSTEMS

GIMIX' CLASSY CHASSIS™ is a heavyweight aluminum mainframe cabinet with back panel cutouts to conveniently connect your terminals, printers, drives, monitors, etc. A 3 position keyswitch lets you lock out the reset switch. The power supply features a ferro-resonant constant voltage transformer that supplies 8V at 30 amps, +15V at 5 amps, and −15V at 5 amps to insure against problems caused by adverse power input conditions. It supplies power for all the boards in a fully loaded system plus two 5 ¼'' drives (yes! even a Winchester) that can be installed in the cabinet. The Mother board has fifteen 50 pin and eight 30 pin slots to give you the most room for expansion of any SS50 system available. 11 standard baud rates from 75 to 38.4K are provided and the I/O section has its own extended addressing to permit the maximum memory address space to be used. The 2 Mhz 6809 CPU card has both a time of day clock with battery back-up and a 6840 programmable timer. It also contains 1K RAM, 4 PROM/ROM/RAM sockets, and provides for an optional 9511A or 9512 Arithmetic Processor. The RAM boards use high speed, low power STATIC memory that is fully compatible with any DMA technique. STATIC RAM requires no refresh timing, no wait states or clock stretching, and allows fast, reliable operation. The system includes a 2 port RS232 serial interface and cables. All GIMIX boards use gold plated bus connectors and are fully socketed. GIMIX designs, manufactures, and tests in-house its complete line of products. All boards are twice tested, and burned in electrically to insure reliability and freedom from infant mortality of component parts. All systems are assembled and then retested as a system after being configured to your specific order.

56KB 2MHZ 6809 SYSTEMS WITH GMXBUX/FLEX/OS-9 SOFTWARE SELECTABLE

With #58 single density disk controller **$2988.59**
With #68 DMA double density disk controller **$3248.49**
to substitute Non-volatile CMOS RAM with battery back-up, add $150.00
for 50 Hz export power supply models, add 30.00

Either controller can be used with any combination of 5" and/or 8" drives, up to 4 drives total, have data recovery circuits (data separators), and are designed to fully meet the timing requirements of the controller I.C.s.

5 ¼" DRIVES INSTALLED IN THE ABOVE with all necessary cables

	SINGLE DENSITY		DOUBLE DENSITY		
	Formatted	Unformatted	Formatted	Unformatted	
40 track (48TPI) single sided	199,680	250,000	341,424	500,000	2 for **$700.00**
40 track (48TPI) double sided	399,360	500,000	718,848	1,000,000	2 for **900.00**
80 track (96TPI) single	404,480	500,000	728,064	1,000,000	2 for **900.00**
80 track (96TPI) double	808,960	1,000,000	1,456,128	2,000,000	2 for **1300.00**

Chart shows total capacity in Bytes for 2 drives.

Contact GIMIX for price and availability of 8" floppy disk drives and cabinets; and 5" and 8" Winchester hard disk system.

128KB 2Mhz 6809 DMA Systems for use with TSC's UNIFLEX or MICROWARES's OS-9 Level 2

(Software and drives not included) **$3798.39**
to substitute 128KB CMOS RAM with battery back-up, add $300.00
for each additional 64KB NMOS STATIC RAM board, add $638.67
for each additional 64KB CMOS STATIC RAM board, add $798.64
for 50 Hz export power supply, add 30.00

NOTE: *UNIFLEX can not be used with 5" minifloppy drives.*

GIMIX has a wide variety of RAM, ROM, Serial and Parallel I/O, Video, Graphics, and other SS50 bus cards that can be added now or in the future. Phone or write for more complete information and brochure.

THE SUN NEVER SETS ON GIMIX USERS

GIMIX Systems are found on every continent, except Antarctica. (Any users there? If so, please contact GIMIX so we can change this.) A representative group of GIMIX users includes: **Government Research and Scientific Organizations** in Australia, Canada, U.K., and in the U.S.; NASA, Oak Ridge, White Plains, Fermilab, Argonne, Scripps, Sloan Kettering, Los Alamos National Labs, AURA. **Universities:** Carleton, Waterloo, Royal Military College, in Canada; Trier in Germany; and in the U.S.; Stanford, SUNY, Harvard, UCSD, Mississippi, Georgia Tech. **Industrial users** in Hong Kong, Malaysia, South Africa, Germany, Sweden, and in the U.S.; GTE, Becton Dickinson, American Hoechst, Monsanto, Allied, Honeywell, Perkin Elmer, Johnson Controls, Associated Press, Aydin, Newkirk Electric, Revere Sugar, HI-G/AMS Controls, Chevron. **Computer mainframe and peripheral manufacturers,** IBM, OKI, Computer Peripherals Inc., Qume, Floating Point Systems. **Software houses;** Microware, T.S.C., Lucidata, Norpak, Talbot, Stylo Systems, AAA, HHH, Frank Hogg Labs, Epstein Associates, Softwest, Dynasoft, Research Resources U.K., Microworks, Analog Systems, Computerized Business Systems.

TO ORDER BY MAIL

SEND CHECK OR MONEY ORDER OR USE YOUR VISA OR MASTER CHARGE. Please allow 3 weeks for personal checks to clear.

U.S. orders add $5 handling if order is under $200.00. Foreign orders add $10 handling if order is under $200.00.

Foreign orders over $200.00 will be shipped via Emery Air Freight COLLECT, and we will charge no handling. All orders must be prepaid in U.S. funds. Please note that foreign checks have been taking about 8 weeks for collection so we would advise wiring money, or checks drawn on a bank account in the U.S.. Our bank is the Continental Illinois National Bank of Chicago, account #73-32033 Visa or Master Charge also accepted.

GIMIX INC. reserves the right to change pricing and product specifications at any time without further notice.

GIMIX* and GHOST* are registered trademarks of GIMIX Inc. © 1981 GIMIX Inc.

FLEX AND Uniflex are trademarks of Technical Systems Consultants Inc. OS-9 is a trademark of Microware Inc. See their ads for other **GIMIX** compatible software

GIMIX Systems are chosen by the Pros because of quality, reliability and features.

GIMIX INC. ✓22

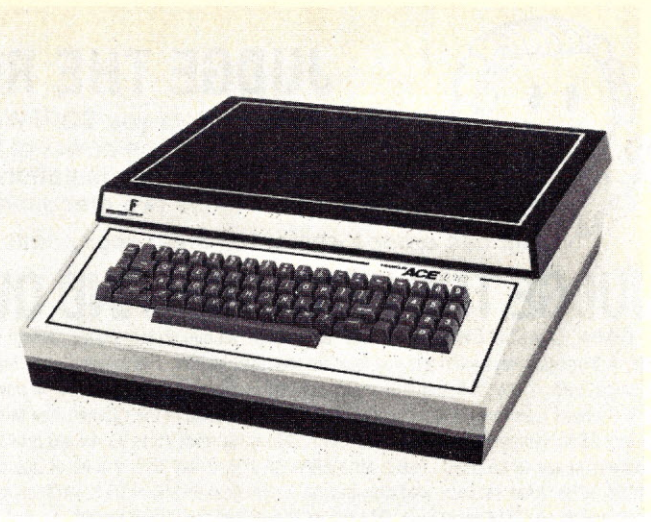
The Company that delivers

Quality Electronic products since 1975.

1337 WEST 37th PLACE, CHICAGO, IL 60609
(312) 927-5510 • TWX 910-221-4055

✓See List of Advertisers on page 130

Data Compass offers the I-47 disk drive system for Heath/Zenith microcomputers.



Franklin Computer Corp. Ace 100.

Intelligent Disk System for Heath/Zenith

An eight-inch floppy disk drive system for use with Heath/Zenith microcomputers is available from Peripheral Products Group, Data Compass, 2730 Regal Park Drive, Anaheim, CA 92806. The I-47 intelligent system reduces the need for host computer intervention, does automatic density sensing and switching, and provides automatic copying and formatting. The system consists of two double-density, double-sided drives with a formatted capacity of 1.25 megabytes per drive. The drives, which are in a master/slave relationship, are built into a compact cabinet with write-protect switches and indicators, power-on LED, and built-in power supply, fan, data cable and complete documentation. Up to three slave drives can be daisychained to the master for a storage capacity of more than 5M. A 6800 microprocessor on the master drive handles control and formatting functions. Price is $2795. Reader Service number 475.

A Low-Cost 1200-bps Modem

Universal Data Systems, 5000 Bradford Drive, Huntsville, AL 35805, has added the Model 212 LP to its modem line. Powered from the telephone line, this manual-answer unit requires no external ac power, and offers full-duplex 1200-bit-per-second asynchronous operation. Its low profile housing is designed for desk-top use. Price is $495. Reader Service number 476.

Apple II Work-Alike

The Franklin Ace 100 is a 64K-byte microcomputer that is hardware and software compatible with the Apple II. It has a full upper- and lowercase keyboard and character generator. The keyboard includes a 12-key numeric pad, an alpha shift lock key and special keys with VisiCalc designations. The basic unit costs $1595.

Franklin Computer Corp., 7030 Colonial Highway, Pennsauken, NJ 08109. Reader Service number 477.

Drive Saver

Optronics Technology, 2990 Altantic Ave., Penfield, NY 14526, is offering a new product for eight-inch floppy disk users that provides automatic on/off control for the drive motor. This eliminates noise from the drive unit and significantly reduces wear. The Drive Control Unit (D.C.U.) is designed for easy installation. Connectors allow it to fit within the drive assembly in series with the drive motor. During drive access, the motor is energized at zero-crossing for low noise and will turn itself off after eight seconds of idle time. D.C.U. is

Universal Data Systems' Model 212 LP modem.

PASCAL

JRT Pascal Version 2, the one-step compiler for super-fast programming, takes another leap forward with two hot new packages:

JKEY—a powerful record retrieval system. Insert, delete, retrieve records of any size—by key. Supports alternate indexes.

JSTAT2—a statistics analysis package. Basic statistics, means & moments, ANOVA, linear & multiple regression, distributions, chi-square. Includes routines for graphing & histograms.

JRT Pascal introduced virtual storage for external procedures, separate compilation, 14 digit floating point arithmetic, 64K strings. Now the most advanced microcomputer programming language offers even more. Phone or write for complete details.

(**JRT PASCAL** only: **$295**—
complete manuals only: **$30.**
JKEY: $95. JSTAT2: $95.
VISA/MC/COD accepted.
CA residents add sales tax.)

✓284

JRT Systems 1891-23rd Avenue
San Francisco, CA 94122
Phone **415/566-4240**

JRT

Type Master

by Steno-Tek Systems

The First Word Processing Package in the Microcomputer Industry To Include:

- **MAIL MERGE**
- **SPELLING CHECKER**

These features are provided with our dynamic screen editor:

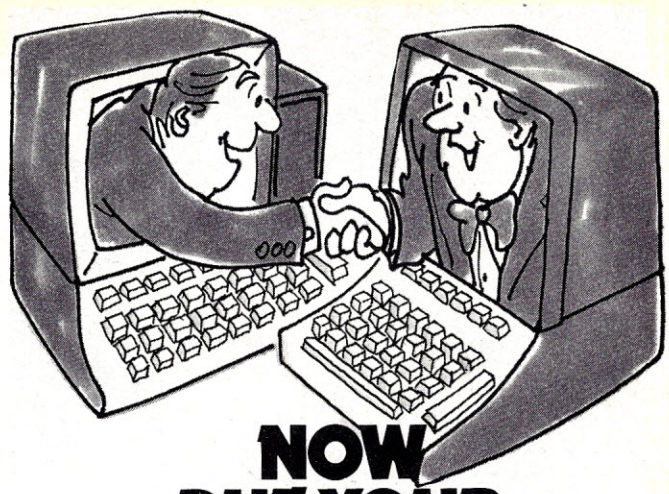
- Mail Merge Data Base
- 20 Field Sort Option
- Mailing Labels
- Personalized Form Letters
- Electronic Card Files
- Automatic File Back-up
- Automatic Centering & Underlining
- On Screen Review
- Conditional Print
- Global Search and Replace
- Word Wrap Editing
- Integrated Spelling Checker
- Table of Contents
- Ideal for G.S.A. and C.S.I. Specification Format
- Hierarchical Paragraph Numbering
- Automatic Page Numbering
- Automatic 'see also' References
- Multi-Column Page Layouts
- Legal Documents from Standard Sections
- Printed Form Fill-out
- Basic System Provided with 20,000 Word Dictionary

Requires 48K CP/M System

complete package **$300**
manual only **25**
annual maintenance fee **15**

COMPUTER MART ✓176
560 W. 14 Mile Road • Clawson, Michigan 48017 • (313) 288-0040

CP/M Registered Trademark Digital Research



NOW PUT YOUR MICROCOMPUTERS ON SPEAKING TERMS.

MicroLink-80™ is the fast, flexible way to transfer data files between computers running SB-80™ or other CP/M-80® systems.

This asynchronous file transfer program makes it easy to transmit the specific binary or ASCII files you choose in a menu-like manner and with wildcard (*.COM) operations.

With MicroLink-80, you'll transfer files accurately, even under noisy line conditions; its error-correcting protocol detects mistakes quickly and allows for automatic reentry.

Use MicroLink-80 to transmit data even between incompatible computers with different disks. It'll help you put your microcomputers on speaking terms.

Lifeboat Worldwide offers you the world's largest library of software from its offices in the U.S.A., Japan, U.K., Switzerland, W. Germany, and France.

Mail to: Lifeboat Associates, 1651 Third Ave., NY, NY 10028 or call (212) 860-0300 or TWX 710-581-2524 (LBSOFT NYK).

☐ Please send details on MicroLink-80.

☐ Please send a free Lifeboat Software Desk Reference.™

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Software Desk Reference, SB-80 and MicroLink-80 are trademarks of Lifeboat Associates.
CP/M-80 is a registered trademark of Digital Research, Inc.

2416

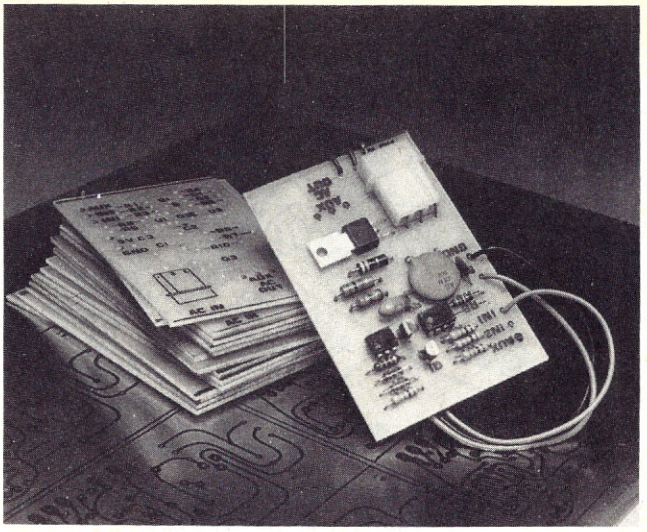
1 Software With Full Support

Lifeboat Associates

World's foremost software source ✓78

Copyright © 1982, by Lifeboat Associates.

✓See List of Advertisers on page 130



Optronics Technology's Drive Control Unit.

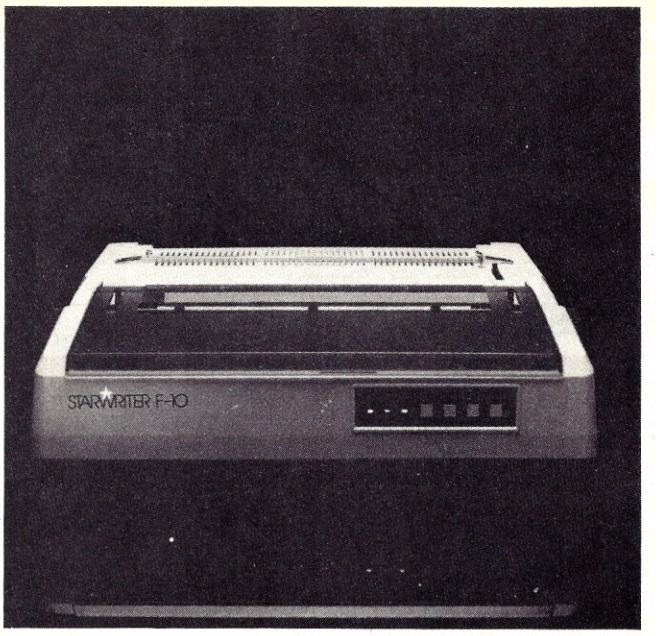
available in kit form for $18.95 or assembled for $29.95. Reader Service number 474.

Switching Device

Advanced Systems Concepts, Inc., PO Box Q, Altadena, CA 91001, announces an instrument that decreases the need for duplicate serial ports or peripheral devices. The ASCI Switch either allows software controllable switching between any two peripherals using only one computer port, or allows two computers to share the same peripheral by software switching of the peripheral between them. Input and output ports of the ASCI Switch are controlled by selecting one of 128 ASCII codes. The control code and data rate are chosen via switches located on the rear of the unit. There is no need for extra cabling or computer cards. The switch can be controlled by either data terminal equipment (DTE) or data communications equipment (DCE) without the need for a null modem. The ASCI Switch can be powered by battery or ac adapter. Model A10 switches ten lines and costs $195; Model A25 switches 24 lines and costs $239. Reader Service number 473.

Versatile Printer Design

The Starwriter F-10 daisywheel printers include such features as low profile design, industry-standard ribbon cartridges, standard parallel or RS-232C interface protocols and extensive built-in word processing functions. You can choose friction feed or optional bidirectional tractor feed, in 40- or 55-cps models; prices vary.



Starwriter F-10 printer from Leading Edge.

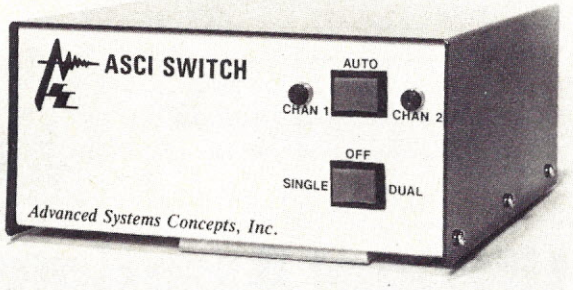
Leading Edge products, 225 Turnpike St., Canton, MA 02021. Reader Service number 472.

Double-Density For Atari

Percom Data Company, 11220 Pagemill Road, Dallas, TX 75243, is now producing disk systems for Atari 400 and 800 computers. The Percom system, which is fully compatible with Atari computers, provides double-density storage, and is available with 40-or 80-track drives. A Percom RFD first-drive system includes disk controller, disk-operating software, interconnecting cable, owner's manual and 5¼-inch disk drive. The provided software adds subroutines to the Atari DOS for handling the higher storage capacity. The system can also be operated with the unmodified, single-density Atari DOS. The RFD controller handles up to four single- or dual-headed drives. Complete RFD systems start at $799. Reader Service number 471.

What's New, Big Blue?

Industry efforts to support the IBM Personal Computer are gaining momentum. Each month Microcomputing *will take a look at some of the*



Advanced Systems Concepts' ASCI Switch.

Percom RFD disk drive systems for Atari microcomputers.

new products being developed for this system. If you have information of interest to our readers, please send it along to: Microcomputing *Editorial, 80 Pine St., Peterborough, NH 03458.*

* * *

The Xedex Corp., 645 Madison Ave., New York, NY 10022, has produced a combination hardware/software device that expands programmable memory and lets the user run CP/M-80 software on his IBM PC. Xedex sells the Baby Blue CPU Plus for $600.

A software solution to the problem of sparse application programs is available from CompuView, 1955 Pauline Blvd., Ann Arbor, MI 48103. CP/M-86 for the IBM PC has the features needed to run the full range of CP/M-86 packages. The VEDIT full-screen editor, intended for program development and simple word processing, is available from CompuView at a discounted price when purchased with CP/M-86.

A text processor that runs with IBM's standard operating system can be purchased from TexaSoft, 1028 N. Madison Ave., Dallas, TX 75208, for $149. Versatext supports Epson and IBM printer features such as wide or compressed printing and special characters.

Laboratory Microsystems, 4147 Beethoven St., Los Angeles, CA 90066, offers complete Forth program development for the IBM PC. The basic package, priced at $100, includes an interpreter/compiler, FIG-Forth line editor, full-screen editor and various utilities. The Floating-point extensions package costs an additional $100, and a Nautilus Forth cross-compiler is an extra $300.

A communications program lets PC users interact with remote time-sharing services or local computers to transfer data files and programs. ASCOM, from Westico, Inc., 25 Van Zant St., Norwalk, CT 06855, is fully compatible with and can communicate with ASCOM running on any CP/M computer. The price is $175.

computer case company

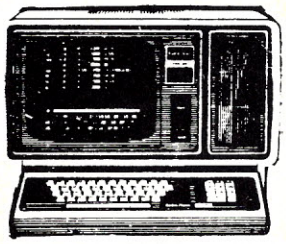
COMP CASE
NOW TOLL FREE
800-848-7548

• IB501 & IB502

• AP101	Apple II with Single Disk Drive	$109
• AP102	Apple II with Double Disk Drives	119
• AP103	Apple II, 9 inch Monitor & Double Drives	129
• AP104	Apple III, two additional Drives & Silentype	139
• AP105	12 inch monitor plus accessories	99
• RS201	TRS-80 Model I, Expansion Unit & Drives	109
• RS202	TRS-80 Monitor or TV set	84
• RS204	TRS-80 Model III	129
• RS205	Radio Shack Color Computer	89
• AT301	Atari Computer & Accessories	109
• P401	Paper Tiger 440/445/460	99
• P402	Centronics 730/737 Line Printer II/IV	89
• P403	Epson MX70 or MX80	89
• P404	Epson MX100	99
• P405	IDS 560 or Prism Printer	109
• IB501	IBM Personal Computer	129
• IB502	IBM Monitor	99
• CC80	Matching Attaché Case (5")	85
• CC90	Matching Attaché Case (3")	75
• CC91	Matching Accessory Case	95

computer case company ✓320
5650 INDIAN MOUND CT. COLUMBUS, OHIO 43213 (614) 868-9464

MASTER ELECTRONICS, INC.
Authorized "TRS-80" *Dealers* - * F-723
CAN SET YOU UP IN A
TRS-80
STATE-OF-THE-ART-COMPUTER
STARTING AT 15% DISCOUNT!



FULLY STOCKED
IN: Model II's
Model III's
ALL- PRINTERS
AND — MORE!!
* PLUS *
THE ALL NEW:
Model 16 and the 8.5 meg. Hard Drive!
CALL US NOW!!!
Toll FREE: 1-800-531-7323
TEXAS CALL COLLECT: 512/689-5536
MasterCard
MASTER ELECTRONICS, INC.
154 NORTH 5th
RAYMONDVILLE, TX 78580
✓72
VISA

dBASE II—$595.00
FREE QUICKSCREEN™ WITH EVERY ORDER
30 DAY MONEY-BACK GUARANTEE

With dBASE II you can extend the power of your microcomputer to jobs that were previously reserved for the larger mainframes. Here's a partial list of applications that dBASE II has been used for:

- General Ledger
- Journal of Accounts
- Accounts Receivable
- Accounts Payable
- Sales Tax Records
- Payroll
- Check Management and Writing
- Time Billing
- Inventory Control
- Job Costing
- Tax Computation
- Document Cross Referencing
- Legal Office Accounting
- Scheduling
- Mailing Labels
- Calendar Events

If your application calls for managing data, dBASE II may be the answer.

You can create a database and start entering data into it in less than a minute.

Type CREATE, then respond to the dBASE II prompts to name the file and define the fields in your records.

Once the record is defined, you can start entering data immediately, or add information later by typing APPEND. In both cases, dBASE presents you with an entire record structure for which you simply fill in some or all of the blanks.

Now, for a limited time only, you can purchase the most powerful DBMS system for your micro for the incredibly low price of $595 delivered. We'll send you a copy of dBASE II, that you can run on your system, for 30 days. If you're not completely satisfied, then just send everything back and we'll return your money, no questions asked! Even if you go for another system, you'll be an informed buyer!! (dBASE II is a fine product by Ashton-Tate)

STANDARD SOFTWARE ✓217
CORPORATION OF AMERICA
10 MAZZEO DRIVE, RANDOLPH, MA. 02368
CALL (617)963-7220 ORDERS ONLY 1-800-343/8420
LARGEST SELECTION OF CPM SOFTWARE IN THE U.S.A.
VISA
MasterCard
MASTERCARD AND VISA ACCEPTED

✓See List of Advertisers on page 130

Edited by Linda Stephenson

Money Management
Audio Analysis Enhancement
CBM Programming Aids

Accounting Software

The latest in Adventure International's new Maxi series is Maxi Cras, an accounting system for personal or small-business use. Maxi Cras takes the tedium out of printing checks, balancing your account and reconciling it with bank statements. It will keep records on disk for unlimited checks and deposits, and it supports as many as 223 income and expense accounts.

Valuable data that can help you manage money more effectively may be hidden in your check register—Maxi Cras organizes this data and provides the reports and statements you need. For more detailed analyses, Maxi Cras interfaces easily with VisiCalc. Requires TRS-80 Model I or III with two disk drives and printer. Price is $99.95.

Adventure International, PO Box 3435, Longwood, FL 32750. Reader Service number 498.

Audio Spectrum Analysis

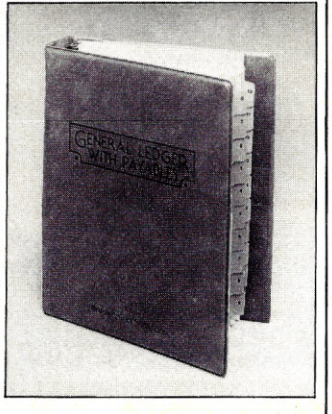
Eventide Clockworks, Inc., 265 West 54th St., New York, NY 10019, now offers software enhancement for the Apple II version of its real-time analyzer. Specsystem, when used with the analyzer and Apple, provides a full range of audio spectrum analysis functions: Reverberation Time (RT-60) displays all 31 ISO-standard ⅓ octave frequencies and the screen can display up to eight frequency plots simultaneously; 3-dimensional spectral surface mode simultaneously displays frequency vs amplitude vs time on the Apple hi-res screen; and a high-resolution real-time analysis display yields greater resolution and more dynamic range options than previously available. The Eventide system (analyzer and Specsystem software) costs $744. Software alone costs $199. A demo program that displays the spectrum analysis of a simulated audio signal will be sent, free, to interested Apple users who mail Eventide a blank 5¼-inch disk. The demo disk simulates the effect of Eventide's hardware/software team for Apple users who haven't yet acquired an analyzer. Reader Service number 483.

Business Accounting

Broderbund Software, Inc., Business Software Division, 1938 Fourth St., San Rafael, CA 94901, offers General Ledger with Payables. This program handles all normal journal ledger and payable functions, plus some management accounting functions. Its capacity is 2000 ledger accounts, unlimited journal entries, 200 open payable accounts, 1900 open invoices, values up to $9,999,999,999.99, 1000 checks per disk and user-definable account numbers up to ten digits. It prints checks and registers, journal audit trails, balance sheets, detailed income statements, department reports and other documents. The program requires a 64K Apple II/II+ with 16-sector disk controller or an Apple III and two disk drives and a printer. Price is $495. Reader Service number 484.

UNIX Features For CP/M

MicroShell runs on any 8080/8085/Z-80 CP/M 2.2 system to bring the power of the UNIX operating system to all CP/M users and software developers. The program manages the interface between CP/M and the user to provide many of the best features of UNIX. Compatibility with CP/M programs is retained but the user can type multiple commands on a line, send normal output to a file instead of the screen and take input from a file instead of the keyboard. MicroShell performs automatic disk drive searches for the program to execute, eliminating the need for disk drive prefixes to filenames.



Broderbund's General Ledger with Payables package includes clearly referenced documentation.

Other features are provided. MicroShell is available on five- or eight-inch disks for $150.

New Generation Systems, Inc., 2153 Golf Course Drive, Reston, VA 22091. Reader Service number 485.

Private Practice

Dental Medical Office Data is a comprehensive database system for physicians and dentists. It comprises 13 programs in which office and personal information can be entered, deleted, changed, sorted, searched and printed in multiple formats. It readily organizes appointments, inventory and employee records. A patient file, phone lists and employee records are maintained, and a dead beat file provides a listing of your most unpopular patients for collection, suits, and no further appointments. The package runs on Apple II+ with disk drive and costs $150.

Andent, Inc., 1000 North Ave., Waukegan, IL 60085. Reader Service number 486.

Utilities for Commodore Computers

Two new programs for the PET and VIC are available from Human Engineered Software, 3748 Inglewood Blvd., Room 11, Los Angeles, CA 90066. HESCOM is a machine-language program that transfers data and programs between two PETs, two VICs or a PET and a VIC. You can

load a program from a disk into the PET/CBM and transfer it to the VIC at 7000 bytes per second—three times the speed of the disk. After modifying the program on the VIC, you could send it back to the PET for saving to a disk or listing on a printer. Price is $49.95 on tape, $52.95 on disk, plus $2 for postage.

HESCAT is a fast, complete cataloging system for a PET/CBM, comprising five programs in Basic and machine language. You can catalog and uncatalog disks and print different reports. Use HESCAT to organize your disk library. Using a full or partial name, in a few seconds you can find which disk a certain program is on. Sorting is done in machine language. Price is $39.95 for HESCAT on disk, plus $2 postage. Reader Service number 487.

Apple Agriculture

Farmplan Computer Systems, Inc., PO Box 65, Campbell, CA 95009, has introduced to the U.S. market a family of software programs for farmers. Dairy Herd Management is a comprehensive system that handles detailed information about each cow's production and breeding records, for herds of up to 590 cows. The Pig Breeding Management program keeps accurate records for a herd of 60 boars and 600 sows with a maximum of 10 litters each. Crop Management provides a field-by-field, crop-by-crop management system; it creates crop budgets and cash flows, prints reports of resources required and used, and maintains records of field applications. Each of these programs costs $950.

The Least Cost Ration program lets the farmer develop least cost rations formulations for any animal operation. The price is $550. All programs run on Apple II+ microcomputers. Reader Service number 488.

6809 Macro Preprocessor

MAC95 is a useful tool for quick and error-free assembly-language program development. MAC95 lets the programmer create new instructions tailored to the application at hand. These new instructions (macros) are contained in text libraries and are copied into the MAC95 macro program before assembly. Each call to a macro is converted into a series of assembler instructions in order to pass the parameters associated with a macro to the macro routine. MAC95 then preprocesses the macro source into assembler source. MAC95 can be used with any assembler that is compatible with TSC's assembler and Flex. It supports position-independent programming techniques. The programmer has five addressing modes for use with a macro's parameters: direct, indirect, immediate, literal and register. All parameter addresses are communicated to each macro via the stack, allowing for reentrant programming. MAC95 requires 16K bytes of memory and Flex 9.0, and costs $50.

MAC Software, PO Box 1129, Duluth, GA 30136. Reader Service number 489.

Apple Pie Charts

Graph, an easy-to-use graphics software package, is the third member of the Personal Filing System line from Software Publishing Corporation, 1901 Landings Drive, Mountain View, CA 94043. This graphics package can stand alone or interface with PFS databases and VisiCalc to produce bar, line or pie charts of presentation quality in minutes. Line and bar graphs can be mixed and matched, and up to four graphs can be displayed on a single set of axes. Bar graphs can be stacked or comparative. Other features include automatic formatting, scaling, legend labelling and pattern fill. Graph runs on the Apple II+, and costs $125. Reader Service number 491.

Same Time Next Year

Right now, when most people are recovering from the annual struggle with tax returns, is a good time to plan for a better way. Two income tax preparation systems, designed to be used by professional accountants or individual taxpayers, are available on disk for CBM and PET microcomputers. The Professional Tax Preparation System handles regular or income-averaging tax returns, simultaneous separate returns and joint returns. It prints directly on 1040 long or short forms and schedules. Price is $800. The Personal Tax Calculation System is a scaled-down version of the Professional package, and calculates forms 1040 and Schedules A, B and G. It is priced at $69.95.

Commodore Business Machines, Inc., Computer Systems Division, 681 Moore Road, King of Prussia, PA 19406. Reader Service number 490.

Utilities

Dantek Software, Inc., 4550 Schoolhouse Road, Batavia, OH 45103, has announced HEXCOM, a set of four file-conversion utilities for CP/M-based systems. The utilities are HEXCOM, COMHEX, HEXROM and ROMHEX. Unlike the slower CP/M load command they replace, these utilities do not require sequential source-program addresses, thus saving programming time and reducing error. The HEXCOM and COMHEX utilities convert hexadecimal files into command files and vice versa. HEXROM and ROMHEX perform the same conversion function between hex files and ROM binary files. Cost of the package is $35. Reader Service number 492.

Professional Accounting

The Client Write-Up System, from INI, Inc., 4013 Chestnut St., Philadelphia, PA 19104, is a general ledger package for CPAs. Based on the Commodore CBM, the system boasts user friendliness, full reporting capabilities, 80-character type-ahead and a special budgeting interface with VisiCalc. Journal entries can be entered and edited using the system's full-screen editing. The program checks to be sure that account numbers are valid and that transactions balance. Reports cover any monthly, quarter-to-date or year-to-date balances from this year, last year or the budget, including ratios and/or variances, subtotals and account groupings. The accountant can organize his clients' charts of accounts in any way, grouping accounts together within schedules or breaking them down into subaccounts. The Client Write-Up system costs $850. Reader Service number 493.

Back-to-Basics Accounting

The general ledger package by Money Disk, PO Box 1531, Richland, WA 99352, is for the small business. No-Nonsense Books, for the Apple II+, is similar to high school double-entry bookkeeping, and takes about two hours to learn. The system is organized around 50 prenamed accounts, including two checking accounts. It maintains sales records in five profit centers for retail and wholesale accounting, complete records of each check written and all journal entries. Each transaction must be balanced before being accepted for recording directly to the ledger accounts. Printed records include sales summary and inventory turnover, operating summary, profit and loss, trial balance and balance sheet. The No-Nonsense Books package costs $225. Reader Service number 494.

Simplified Data Entry

Imput is a machine-language subroutine, called from Microsoft Basic (or other compatible language), which lets the programmer specify parameters for strings entered from the keyboard. Screen position, maximum length, acceptable characters, uppercase conversion, numerical

precision and automatic real-time numeric justification can all be specified before calling the routine. Imput also lets the programmer create input masks for ease of data entry; the entered data can be highlighted while the mask remains at standard intensity. Cursor controls and commands are preset to match other popular application programs, and can easily be redefined by the user to accommodate program or terminal requirements. Requires CP/M. Price is $79.

Paladin Systems, 2714 W. Ocean Front, Newport Beach, CA 92663. Reader Service number 495.

Space Game

Voyager Software, PO Box 1126, San Francisco, CA 94115, offers Starship Commander, a complex strategic space-battle simulation featuring 30 high-resolution color displays for the Apple II. As commander of the USS Ranger, a player must locate and destroy combinations of enemy destroyers, cruisers and dreadnoughts, using over 40 commands and 100 options to manage the crew, maintain power, maneuver the ship, make repairs, fire weapons and communicate with the enemy. A special feature of the game lets players send and receive messages from the enemy. The crew of 120 men and women can be assigned by name to each of three shifts; the ship also has 50 droids. Each of the ship's seven stations—Engineering, Science, Weapons, Defense, Communications, Life Support and Navigation—has its own display and command console. All commands are entered by paddle. A player can use manual or automatic systems control. The game includes a save feature. Price is $49.95. Reader Service number 496.

Ada for Micros

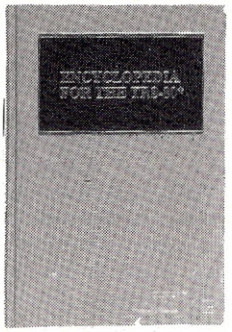
A native code, fully recursive, two-pass Ada compiler is available from SuperSoft, Inc., PO Box 1628, Champaign, IL 61820. Ada is the new language specified by the Defense Department for all programming and is certain to become a dominant computer language as a result, with broad applications in business and finance, education and mathematical applications. This highly structured, sophisticated language is also well-suited to systems programming. The SuperSoft offering is a subset that supports many features of the full Ada language. It requires CP/M. Price is $250. Reader Service number 497.

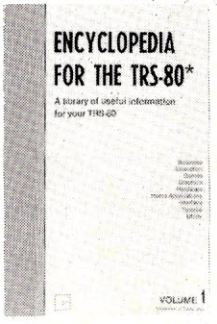
North Star Offerings

Four new software packages have been added to the financial and business library available from Omni Software Systems, Inc., 146 North Broad St., Griffith, IN 46319. All run under the North Star operating system and require 32K memory and disk drives. Business Financial Advisor is an income/expense data manager intended for use by the small businessperson. Its one-screen summary profit and loss display shows all billings and expenses, outstanding receivables and payables, gross and net profits, and estimated tax liability. It costs $95. Account Analysis permits posting to more than 60 different accounts, each one titled to the user's specifications. Any set of accounts can be compared with any other set and all data can be saved for future reference. The price is $75. DOC—The Word Processor provides a menu-driven text processor for $75. The Invoicer Plus is a general billing system for accountants, lawyers, consultants or any small business that sells a number of different products or services. It prepares invoices or statements on preprinted forms with descriptions and prices of up to 100 products or service procedures. Invoice Plus costs $95. Reader Service number 499.

microcomputing book nook

ALL NEW—FOR 80 OWNERS
ENCYCLOPEDIA FOR THE TRS-80*





ENCYCLOPEDIA FOR THE TRS-80* is the newest peripheral for your microcomputer. This ten-volume reference series contains programs and articles especially selected to extend the documentation that comes with the TRS-80. Volumes of the **Encyclopedia** are being issued one-at-a-time, approximately six weeks apart. This means that each new volume will reflect the latest developments in TRS-80 microcomputing. **Encyclopedia for the TRS-80** is available in two editions. The deluxe COLLECTOR'S EDITION has a handsome green and black hard cover with a dust jacket. A soft cover edition is also available.

To order single hard cover volumes of the **Encyclopedia** please specify:

Volume 1	**EN8101**	**$19.95***
Volume 2	**EN8102**	**$19.95***
Volume 3 (avail. Nov.)	**EN8103**	**$19.95***
Volume 4 (avail. Jan.)	**EN8104**	**$19.95***
Volume 5 (avail. Feb.)	**EN8105**	**$19.95***
Volume 6	**EN8106**	**$19.95***
Volume 7	**EN8107**	**$19.95***

To order single soft cover volumes of the **Encyclopedia** please specify:

Volume 1	**EN8081**	**$10.95***
Volume 2	**EN8082**	**$10.95***
Volume 3 (avail. Nov.)	EN8083	$10.95*
Volume 4 (avail. Jan.)	EN8084	$10.95*
Volume 5 (avail. Feb.)	**EN8085**	**$10.95***
Volume 6	**EN8086**	**$10.95***
Volume 7	**EN8087**	**$10.95***

SPECIAL INTRODUCTORY OFFER
Order the entire set (the first ten volumes) of the **Encyclopedia for the TRS-80** and receive the tenth volume **FREE!**

10 Volume deluxe hard cover COLLECTOR'S EDITION —a $199.50 value.
EN8100 $164.00 postpaid

10 Volume soft cover edition, a $109.50 value.
EN8080 $83.00 postpaid

ENCYCLOPEDIA LOADER is the software companion to the Encyclopedia for the TRS-80. This special series of cassettes will allow you to load selected programs from the Encyclopedia instantly. Hours of keyboarding time and the aggravating search for typos is eliminated by using the **Encyclopedia Loader.**

Encyclopedia Loader for Volume 1 of the Encyclopedia of the TRS-80 is available at a **Special Introductory** Price of $12.95 (a $14.95 value). To take advantage of this offer specify: **EL800111 $12.95***

Additional Encyclopedia Loaders will be available as each volume of the Encyclopedia for the TRS-80 is issued. To order specify **Encyclopedia Loader:**

Volume 2	**EL8002**	**$14.95***
Volume 3	**EL8003**	**$14.95***
Volume 4	**EL8004**	**$14.95***
Volume 5	**EL8005**	**$14.95***
Volume 6	**EL8006**	**$14.95***
Volume 7	**EL8007**	**$14.95***

*TRS-80 and TRSDOS are trademarks of the Radio Shack Division of Tandy Corporation.

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to *Microcomputing* Book Department ● Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add $1.50 for first book, $1.00 each additional book, $10.00 per book foreign airmail. Please allow 4–6 weeks for delivery. Questions regarding your order? Please write to Customer Service at this address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

DEALER DIRECTORY

El Monte, CA

Eagle II and M/ACOM-OSI business computer specialist. Serving greater Los Angeles area with all your business computer needs. In-house service, custom programming, terminals, printers, etc. Open 9 AM-6 PM. **Computer Challenge Corp., 3380 Flair Drive, El Monte, CA 91731.**

N. Hollywood, CA

Wholesale prices to dealers and computer club members! Anadex, Centronics, Corvus, Delta, Diablo, Epson, Godbout, Hayes, IDS, C. Itoh, Micro Pro, Mountain Computer, NEC, Novation, Okidata, Qume, TI, Televideo, Vector Graphic, Vista, Zenith and others. **Patio Computer Sales Co., Suite 204, 5451 Laurel Canyon Blvd., N. Hollywood, CA 91607. 762-0020.**

Riverside, CA

Visit our Computer Support Center for the Inland Empire's largest selection of ICs, books and computer accessories. Open daily. Check our prices and friendly service. **Inland Electro-Mart, 8624 California Ave., Riverside, CA 92504. 687-3776.**

Bridgeport, CT

Excellent service and prices on Apple, Zenith, NEC, Atari, Xerox, HP computers. Also boards and accessories by Microsoft, Hayes, Epson, IDS and others; software too. For best service call for appointment. Mon-Sat. 10AM-6PM **Conn. Infosystems, 218 Huntington Rd., Bridgeport, CT 06608. 203-579-0472.**

Nokomis, FL

We are the leading area computer store. We carry Cromemco, Apple, Vector Graphic; printers and terminals. We offer full software support including G/L, A/R, payroll and word processing. **Computer Centre, 909 S. Tamiami Trail, Nokomis, FL 33555. 484-1028.**

Sarasota, FL

Your personal and business computer store for Dynabyte, Vector, HP-85, Atari and Epson. Structured Systems and Micro-Pro software. Computer furniture and books by Osborne or Hayden. Sales, service and supplies. **Computer Crossroads, 3800 S. Tamiami Trail, Sarasota, FL 33579. 349-0200.**

Aurora, IL

Microcomputer systems for home or business; peripherals, software, books and magazines. Apple, Hewlett-Packard Series 80 Systems, HP calculators, IDS, Qume, Starwriter printers. **Farnsworth Computer Center, 1891 N. Farnsworth Ave., Aurora, IL 60505. 851-3888.**

Noblesville, IN

Nationally known microcomputer software systems at discount prices. PLUS free delivery and installation in Indiana. Write, call or stop in for free price list. **Harbourtown Sales, 14-W Harbour Town Shoppes, Box 489, Noblesville, IN. 877-7577.**

Pasadena, MD

Altos, Apple, Osborne, Atari—systems, software, service. Not just another computer store! We're a full-service problem solving center for small businesses. **Computer Crossroads, Inc., 9143G Red Branch Rd., Columbia, MD; 8220 Ritchie Hwy., Pasadena, MD. 730-5513/647-7111.**

Lodi, NJ

Computer hardware: North Star, Zenith, Atari, CBM/PET, Qume, Epson and others. Software: EduWare, Professional Software, Zenith, North Star, Programma, Personal Software and others. Factory trained service dept. Books, magazines, etc. Full product line on display. **Comtek Electronics, Inc., Rt. 46 West, Lodi, NJ. 472-2440.**

River Edge, NJ

Discount software—up to 25 percent off business, utility, recreational, educational and home programs. Apple, Atari, TRS-80 and PET. Atari computers always on sale. **Software City, 111 Grand Ave., River Edge, NJ 07661.**

Chautauqua, NY

Retail book store featuring the Disassembled Handbook for TRS-80 Volumes 1, 2, 3. English, German and French language editions. 9 AM–5 PM weekdays. Come and visit us. **Richcraft Computer Book Store, 1 Wahmeda Ave., Chautauqua, NY 14722. 753-2654.**

Staten Island, Brooklyn, NY

Computer hardware: North Star, Zenith, Atari, CBM-PET, Qume, Epson and others. Software: EduWare, Professional Software, Zenith, North Star, Programma, Personal Software and others. Factory trained service department. Books, magazines, etc. Full product line on display. **Comtek Electronics Inc., Staten Island Mall, Staten Island, NY. 698-7050; Coney Island Ave. and Ave. X, Brooklyn, NY. 332-5933.**

Montreal, Quebec

We do expert service on all microcomputers and peripherals (CRT, printer, floppy disk). North Star, Hazeltine, Cromemco, Centronics, Shugart, Siemens, Apple, TRS, Epson, S-100. **Montreal Data Centre, 120 Ricard, Legardeur, Montreal, Quebec. 585-8801.**

Austin, TX

Try computer classifieds. Buy, sell, trade, employment, etc. No charge to read ads. 300 baud, 24 hours, 512-346-4495. **Oracle Systems, 8348 Summerwood, Austin, TX 78759.**

Dallas, TX

Dealer in used computer hardware and electronic parts. Special on daisywheel printers. Xerox word processing equipment, dual card printers and display systems. Catalog $1. **Rondure Company, (The Computer Room) Dept. kb, 2522 Butler St. Dallas, TX 75235.**

Woodbridge, VA

Computer/word-processing systems for business, school, home. Software, disk drives, printers. Books, magazines, supplies. Authorized CBM/PET dealer, service. Consulting, training, maintenance contracts. MWF noon-8 PM, Saturday 9 AM-3 PM. **Virginia Micro Systems, Inc., 14415 Jefferson Davis Highway, Woodbridge, VA 22191. 491-6502. Washington Metro 643-1063.**

Say you saw it in *Microcomputing.*

Dealers: Listings are **$15** per month in prepaid quarterly payments, or one yearly payment of **$150**, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-9471 or write *Microcomputing*, Ad Department, Peterborough, NH 03458.

Big Blue, Where Are You?

Microcomputing is looking for articles about the IBM Personal Computer. The magazine is inviting Personal Computer (PC) owners and users to share their knowledge of the system with the readers of *Microcomputing*

Have you made any improvements to the system or interfaced any interesting peripherals? Are you finding the necessary software for the system? Have you developed any programs or modifications of programs for use on the Personal Computer? If so, *Microcomputing* is interested in your experiences. Other articles ideas include:

- new developments
- unique applications
- undocumented features

Send your articles to: *Microcomputing*, Editorial Department, 80 Pine St., Peterborough, NH 03458. Author's guidelines to assist you with the preparation of your article are available by writing to the above address.

MICRO QUIZ

(from page 16)

Answer: 715

This program computes the value of "N objects taken R at a time":

$$\binom{N}{R} = \frac{N!}{R!(N-R)!} = \frac{13!}{9!\,4!}$$

CALENDAR

Applefest/Boston

The second Applefest/Boston will be held May 14 to 16 at Hynes Auditorium, Boston, MA. Show hours are 11 AM to 6 PM daily. The show will have over 200 displays and booths, plus seminars and panel discussions. Ticket prices are $6 per day or $15 for a three-day ticket.

Call or write National Computer Shows, 824 Boylston St., Chestnut Hill, MA 02167. 617-739-2000.

Micros in Education Workshops

The spring series of workshops, Microcomputers in Education, offered by the Technical Education Research Centers (TERC), will be held on May 18, 19 and 20 at Gutman Library in Cambridge, MA; and June 7, 8 and 9 at the Taft School in Watertown, CT. Ten one-day workshops are offered, designed for professional development for educators at all levels, elementary through college. Each workshop will emphasize hands-on experience with a variety of microcomputers.

For further information on these and upcoming workshops in other locations write: TERC, 8 Eliot St., Cambridge, MA 02138. 617-547-3890.

Conference on Technology and Special Education

The New York State Association for Educational Data Systems will sponsor a conference on computer applications in special education for administrators, teachers and parents on May 22. The conference will be held at the Mill Neck Manor Lutheran School for the Deaf, Frost Mill Road, Mill Neck, L.I., NY 11765.

For further information, contact Dr. Dolores Shanahan, Commack Public Schools, Indian Hollow Computer Lab, Kings Park Road, Commack, NY 11725 or Jerry Burke, Half Hollow Hills High School, Dix Hills, NY 11746.

Electro '82

Electro '82, an electronics exhibition and convention, will be held in Boston May 25–27. The theme of this year's program will be the "Electronics Frontier." Included in the events at Electro will be a professional program with sessions on topics such as research, medical electronics, robotics, speech recognition, memory and gate array. Exhibits and a communications conference are also part of the Electro program.

For more information call 617-232-4193 or 800-421-6816.

Interfacing and Instrument Automation Workshop

Virginia Polytechnic Institute and State University will hold a workshop on designing microcomputer interfaces May 31–June 4 in Blacksburg, VA.

For more information contact Dr. Linda Leffel, CEC, Virginia Tech, Blacksburg, VA 24061. 703-961-4848.

National Computer Conference

The National Computer Conference will be held June 7–10 at the Astrodomain, Houston, TX.

Registration must be received by May 3. To register write to NCC '82 Registration, AFIPS PO Box 9658, Arlington, VA 22209. For further information call 703-558-3608.

Swapfest in St. Paul

The North Area Repeater Association will sponsor the state's largest swapfest and exposition of personal computer and communication equipment on June 5 at the Minnesota State Fairgrounds, located on Snelling Ave. north of I-94. Exhibits, booths and prizes. Admission $3.

For more information or reservations write Amateur Fair, PO Box 30054, St. Paul, MN 55175.

National Computer Graphics Association Conference

The third annual National Computer Graphics Association conference and exposition will be held June 13–17 in Anaheim, CA. Tutorials, technical sessions and exhibits make up the conference program.

For further information contact NCGA, 2033 M St. N.W., Suite 330, Washington, D.C. 20036. 202-466-5895.

Computerfest '82

The Midwest Affiliation of Computer Clubs is sponsoring the seventh annual Computerfest, June 18–20 at Franklin University, Columbus, OH. Computerfest will include lectures, demonstrations, exhibitions and a flea market.

For more information contact M.A.C.C., c/o Professor Don Moore, 201 South Grant Ave., Columbus, OH 43215.

MIT's Computer Music Courses

The Experimental Music Studio at the Massachusetts Institute of Technology will offer its sixth summer session from June 21 to July 30. The session consists of two complementary workshops. The first, Techniques of Computer Sound Synthesis (June 21–July 2), explores the latest developments in digital audio processing. The Workshop in Computer Music Composition (July 5–30), allows composers to use the computer as an expressive musical instrument. The courses are designed to provide participants with extensive hands-on experience using the studio's facilities. No special technical knowledge is required or assumed.

For application information, contact Director of the Summer Session, Room E19-356, Massachusetts Institute of Technology, Cambridge, MA 02139.

Basic Training Camp

Lake Forest College will sponsor a series of one-week computer camp sessions from June 20–Aug. 6. The sessions are open to all youngsters 12 to 18 years old and will focus on the Basic language.

For more information contact Dr. Lowell Carmony, Associate Professor of Mathematics and Computer Studies, Lake Forest College, Lake Forest, IL 60045. 312-234-3100.

Videotex '82

The Videotex '82 Conference will be held June 28–30 at the New York Hilton, New York City.

For information contact Online Conferences Ltd., Argyle House, Northwood Hills, HA6 1TS, Middlesex, England, United Kingdom. Northwood phone: (09274) 28211; international phone: 44-9274 28211; Telex: 923498; cable: Online Northwood.

National Computer Camp

National Computer Camp will be held in Simsbury, CT from July 11–Aug. 16 for youngsters ages ten to 18. In addition to learning about computers, children will have an opportunity to enjoy recreational activities including swimming and tennis.

For more information contact Michael Zabinski, Ph.D., National Computer Camp, PO Box 624, Orange, CT 06477. 203-795-3049.

Origins '82

Origins '82, the eighth annual national Adventure Gaming show, will be held July 23–25 at the University of Maryland, Baltimore, MD. This gaming convention will include exhibitions, tournaments, seminars and demonstrations.

For more information contact Origins '82, PO Box 15405, Baltimore, MD 21220. 301-539-4634.

Peripherals '82

The first International Peripheral Equipment and Software Exposition (Peripherals '82) will be held Sept. 29, 30 and Oct. 1 at the Anaheim Convention Center, Anaheim, CA.

For more information on exhibiting or visiting Peripherals '82 contact Cahners Exposition Group, 222 West Adams St., Chicago, IL 60606. 312-263-4866, Telex: 256148.

CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The $5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The $10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to: **Classifieds, *Microcomputing*, Peterborough, NH 03458**. Do not include any other material with your ad as it may be delayed.

FREE machine-language monitor for Elf II. Does all that the Netronics monitor does plus more and uses the terminal, not the hex keypad. Runs in 1.25K and can run from a PROM. Has a 300 baud software UART and a parallel printer out routine. Please send name and address with $2 to cover reproduction and mailing to: John Ware, 2257 6th Ave., Ft. Worth, TX 76110.

For sale: 200ns 4116 16K RAMS. High reliability ceramic pkg. Rplcmnt guar. $16/8, $30/16 or $55/32. Include $2 for postage to: K.D. Gennetten, 1431 Tarryton Drive, Ft. Collins, CO 80526. 303-226-1395.

For sale: Centronics 779 dot matrix printer. Features: 60 cps, up to 132 columns, RS-232 interface, parallel interface board, $350. 617-227-5813.

Heath H9 video terminal modified for 24×80 and upper- and lowercase character entry and display, $275. Also SWTPC AC-30, $20; ASCII keyboard, $25; many parts including 6800s and I/O chips. Heath HW101 SSB transceiver with HP23A power supply, $425. SASE for complete list. T. Glaser, Rt 1 Box 312, Rochester, MN 55901. 507-285-9871.

For sale: Apple Silentype printer, $280. Puchased new in Nov. 81 but no longer needed. R.L. Henne, 5870 Wood Flower, Burke, VA 22015. 703-250-5323.

Microtek MT-80P printer. Excellent condition. Two years old. Originally $900+. Priced at $500 for immediate sale. I will pay shipping. Irv Brechner—201-731-4382 up to 9 PM, eastern time please.

Used Heath H-8 memory board, I/O card, terminal, software and complete H-8 system. Ten to 50 percent off list price. Send for free listing. D. Wong, Box 406, Groton Fall, NY 10519.

Elf II with giant board, 8K memory, terminal, complete software package, and manuals, $400. Steven Powell, 12607 Wellington Park, Houston, TX 77072. 713-495-0488.

IBM 2970 Selectric I/O computer terminal $325, 35 Teletype $60. Call 608-582-4124 for Kurt.

TRS-80 user's group gives FREE sample newsletter. Reviews programs right for YOUR needs. Avoid ripoffs. Send 37¢ stamped SASE. Software Review(TM), 92 Washington Ave, Cedarhurst, NY 11516.

For sale SWTPC 6800/2 system. MPA2, BOAZ D64KB(32K), MP8M, MPS, F&D PMB1, AC30, CT1024, MPLA, PR40, MF68, DC1, MPR. Bare boards MPS, MPLA, MPT and MP09A. Assorted software. 901-795-5122 evenings.

CLUB NOTES

Apple User's Group

The Apple User's Group (Sydney) meets at the Sydney Grammar School, Science Auditorium, on the second Monday of every month at 6:30 PM. The group maintains a software library on disk and publishes a monthly newsletter, *Applecations*.

For further information contact A.U.G. (Sydney), PO Box 505, Bankstown, N.S.W., 2200 Australia.

Computer-Chip Experimenters

The Association of Computer-Chip Experimenters (A.C.E.) meets the second Tuesday of each month, Sept. through June at 7:30 PM, room B123, Sheridan College, 1430 Trafalgar Rd., Oakville, Ontario.

For more information write to A.C.E., c/o Bernie Murphy, 102 McCraney St. East, Oakville, Ontario, Canada, L6H 1H6. 416-845-1630.

MUMPS User's Group Meeting

The annual MUMPS User's Group meeting will be held June 7–11 at the Denver Hilton, Denver, CO.

For registration information contact Professional Associates, Charles White, 2012 Big Bend Blvd., St. Louis, MO 63117. 314-781-9192. The call for papers is available from MUMPS User's Group, Box 37247, Washington, D.C. 20013. 301-779-6555.

Long Island Computer Association

The Long Island Computer Association meets the third Friday of each month at 8 PM in room 508, building 500, The New York Institute of Technology, Old Westbury Campus, Hicksville, NY.

For more information write to L.I.C.A., PO Box 71, Hicksville, NY 11802.

SS-50/6800 Newsletter

A non-profit newsletter and products directory with hardware and software information about SS-50/6800 computers has been organized in England.

For more information send a S.A.S.E. to T.K. Boyd, Belmont School, Feldmore, Holmbury St. Mary, Dorking, Surrey, RH5 6LQ.

New Zealand Micro Club

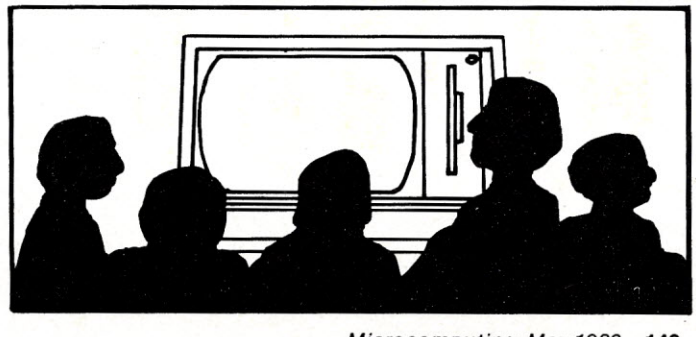
The New Zealand Microcomputer Club meets several times a month in Aukland.

For more information write to N.Z. Microcomputer Club, PO Box 6210, Aukland, New Zealand.

Capital Area TRS-80 User's Group

The Capital Area TRS-80 User's Group meets the third Wednesday of the month at Computerland.

For further information write C.A.P.A.T.U.G., c/o Computerland of Harrisburg, 4644 Carlisle Pike, Camp Hill, PA 17011.



HANLEY ENGINEERING CORP.

We Will Beat All Competitor's Prices!!!

Guaranteed to ship within 24 hours on all telephone orders or YOUR ORDER FREE!!

800-426-2668
206-643-0792

4K STATIC RAM 8/$20.00

16K Memory 8/$16.00

74LS00

74LS00	.25	74LS123	.90	74LS259	2.80
74LS01	.25	74LS124	2.95	74LS260	.60
74LS02	.25	74LS125	.90	74LS261	2.45
74LS03	.25	74LS126	.80	74LS266	.50
74LS04	.25	74LS132	.75	74LS273	1.60
74LS05	.25	74LS136	.50	74LS275	3.30
74LS08	.30	74LS138	.75	74LS279	.50
74LS09	.25	74LS139	.75	74LS280	1.95
74LS10	.25	74LS145	1.10	74LS283	.95
74LS11	.30	74LS147	2.25	74LS290	1.20
74LS12	.30	74LS148	1.25	74LS293	1.80
74LS13	.40	74LS151	.75	74LS295	1.00
74LS14	.75	74LS153	.75	74LS298	.95
74LS15	.30	74LS155	.90	74LS299	2.50
74LS20	.25	74LS156	.90	74LS323	3.95
74LS21	.30	74LS157	.75	74LS324	1.75
74LS22	.25	74LS158	.75	74LS347	1.95
74LS26	.30	74LS160	.90	74LS348	1.95
74LS27	.35	74LS161	.90	74LS352	1.50
74LS28	.35	74LS162	.90	74LS353	1.50
74LS30	.25	74LS163	.90	74LS363	1.35
74LS32	.35	74LS164	.90	74LS365	.90
74LS35	.55	74LS165	.90	74LS366	.90
74LS37	.50	74LS166	2.00	74LS367	.65
74LS38	.35	74LS168	1.70	74LS368	.65
74LS40	.25	74LS169	1.70	74LS373	1.15
74LS42	.50	74LS170	1.70	74LS374	1.75
74LS47	.75	74LS173	.75	74LS375	.65
74LS48	.75	74LS174	.90	74LS377	1.40
74LS49	.75	74LS175	.90	74LS385	1.85
74LS51	.25	74LS181	2.10	74LS386	.60
74LS54	.35	74LS189	9.95	74LS390	1.85
74LS55	.35	74LS190	.95	74LS393	1.85
74LS83	1.20	74LS191	.95	74LS395	1.60
74LS73	.35	74LS192	.80	74LS399	1.65
74LS74	.40	74LS193	.90	74LS424	2.95
74LS75	.50	74LS194	.95	74LS447	.35
74LS76	.40	74LS195	.90	74LS490	1.90
74LS78	.50	74LS196	.80	74LS630	75.00
74LS83	.75	74LS197	.80	74LS640	3.00
74LS85	1.10	74LS221	1.15	74LS641	3.00
74LS86	.40	74LS240	1.15	74LS642	3.00
74LS90	.60	74LS241	1.15	74LS645	3.00
74LS91	.80	74LS242	1.85	74LS668	1.65
74LS92	.65	74LS243	1.85	74LS669	1.85
74LS93	.60	74LS244	1.00	74LS670	2.15
74LS95	.80	74LS245	1.95	74LS674	9.60
74LS96	.80	74LS247	.75	74LS682	3.15
74LS107	.40	74LS248	1.20	74LS683	2.25
74LS109	.40	74LS249	.95	74LS684	2.35
74LS112	.40	74LS251	1.25	74LS685	2.35
74LS113	.40	74LS253	.80	74LS688	2.35
74LS114	.50	74LS257	.80	74LS689	2.35
74LS122	.45	74LS258	.80	74LS152	1.25

74S00

74S00	.40	74S132	1.20	74S201	14.90
74S02	.45	74S133	.95	74S225	8.90
74S03	.45	74S134	.65	74S240	3.95
74S04	.75	74S135	1.45	74S241	3.70
74S05	.75	74S138	1.05	74S251	1.85
74S08	.45	74S139	1.20	74S253	7.40
74S09	.75	74S140	1.40	74S257	1.35
74S10	.65	74S151	1.15	74S258	1.45
74S11	.80	74S153	1.15	74S260	1.80
74S15	.65	74S157	1.15	74S274	19.90
74S20	.65	74S158	1.40	74S275	19.90
74S22	.75	74S161	2.80	74S280	2.85
74S30	.45	74S162	3.70	74S287	4.70
74S32	.95	74S163	3.70	74S288	4.40
74S37	1.85	74S168	4.60	74S289	6.95
74S38	1.65	74S169	5.40	74S301	6.90
74S40	.40	74S174	1.05	74S373	3.40
74S51	.75	74S175	1.05	74S374	3.40
74S64	.75	74S181	4.45	74S381	7.90
74S65	1.20	74S182	2.90	74S387	5.70
74S74	.65	74S188	3.90	74S412	2.95
74S85	2.35	74S189	14.90	74S471	9.90
74S86	1.40	74S194	2.90	74S472	16.80
74S112	1.55	74S195	1.85	74S474	17.80
74S113	1.95	74S196	4.85	74S482	15.50
74S114	1.45	74S197	4.20	74S570	7.75
74S124	2.75			74S572	7.75

4000CMOS

4000	.35	4040	.95	4501	.50
4001	.35	4041	.95	4502	.95
4002	.35	4042	.75	4503	.65
4006	.95	4043	.85	4505	8.95
4007	.35	4044	.85	4506	1.25
4008	.95	4046	.95	4507	.95
4009	.45	4047	.95	4508	1.95
4010	.45	4048	.75	4510	.95
4011	.35	4049	.55	4511	.95
4012	.35	4050	.55	4512	.95
4013	.45	4051	.95	4514	2.25
4014	.95	4052	.95	4515	2.25
4015	.95	4053	.95	4516	1.50
4016	.45	4055	2.75	4518	1.25
4017	.95	4056	2.75	4519	1.25
4018	.95	4059	9.95	4520	1.25
4019	.45	4060	1.25	4522	1.25
4020	.95	4066	.75	4526	1.25
4021	.95	4068	.40	4527	1.75
4022	.95	4069	.40	4528	1.25
4023	.35	4070	.40	4531	.95
4024	.75	4071	.30	4532	1.75
4025	.35	4072	.30	4539	1.75
4026	1.95	4073	.30	4543	1.95
4027	.65	4075	.30	4553	4.95
4028	.80	4076	.95	4555	.95
4029	.95	4078	.50	4556	.95
4030	.45	4081	.40	4558	2.25
4031	1.50	4082	.40	4568	5.95
4032	2.75	4085	.95	4581	1.95
4033	2.75	4086	.95	4582	1.95
4034	2.75	4093	.95	4584	.95
4035	.85	4094	3.95	4585	.95
4037	2.50	4099	1.75	4702	9.95

LINEAR

7805CT	.85	LM301V	.75	LM567V	1.25
		LM308V	.75	LM723	.50
7812CT	.85	LM309K	1.50	LM733	.95
7815CT	.95	LM311V	.60	LM741V	.30
		LM317T	1.90	LM747	.75
7805KT	1.40	LM317K	3.75	LM748V	.50
7812KT	1.40	LM318N	1.50	LM1414	1.50
7815KT	1.40	LM323K	3.75	LM1458V	.65
78L05	.65	LM324N	.60	DS1488N	1.00
78L12	.65	LM337K	3.95	DS1489D	1.00
7905CT	.95	LM339	.75	LM1889	2.45
7912CT	.95	LM377	2.25	LM3900	.60
7915CT	1.15	LM380	1.25	LM3909	.90
		LM386V	1.25	LM3914	3.75
7905K	1.50			LM3915	3.75
7912K	1.50	LM555V	.40	LM3916	3.75
79L05	.75	LM556	.70	DS75451	.40
79L12	.75	LM565	.95	DS75452	.40
79L15	.75	LM566V	1.50	DS75453	.40

74C00 CMOS

74C00	.35	74C161	1.95	74C908	2.00
74C02	.35	74C162	1.95	74C909	2.70
74C04	.35	74C163	1.95	74C910	9.90
74C08	.35	74C164	1.95	74C911	9.90
74C10	.35	74C165	1.95	74C912	9.90
74C14	1.45	74C173	1.95	74C914	1.90
74C20	.35	74C174	2.20	74C915	1.90
74C30	.35	74C175	2.20	74C917	2.70
74C32	.50	74C192	2.20	74C918	1.90
74C42	1.70	74C193	2.20	74C920	16.00
74C48	2.05	80C97	.90	74C922	5.90
74C73	.65	82C19	4.95	74C923	5.90
74C74	.85	74C195	2.20	74C925	6.70
74C76	1.90	74C221	2.20	74C926	7.90
74C83	1.90	74C240	2.20	74C927	7.90
74C86	.90	74C244	2.20	74C928	7.90
74C89	4.50	74C373	2.70	74C929	7.90
74C90	1.70	74C374	2.70	74C930	7.90
74C93	1.70	74C901	.80	74C932	1.95
74C95	1.70	74C902	.80	74C941	2.75
74C107	.95	74C903	.80	74C989	9.90
74C150	5.70	74C904	.80	80C95	.85
74C151	2.20	74C905	10.90	80C96	.90
74C154	3.20	74C906	.90	88C30	3.95
74C157	1.75	74C907	.90	88C29	3.95
74C160	1.95				

HITACHI
2K x 8 CMOS RAM 150NS
Pin Compatible with 2716
HM6116P-3
$13.00

8 For $88.00

8200

8080A	3.95
8085A	8.95
8085A-2	11.95
8086	99.95
8088	39.95
8155	11.25
8185	29.95
8202	45.00
8205	3.95
8212	1.90
8214	3.85
8216	1.80
8224	2.50
8226	1.80
8228	4.90
8238	4.90
8243	4.50
8251A	5.45
8253	9.80
8255A - 5	5.20
8257 - 5	8.95
8259A	6.95
8271	60.00
8272	39.95
8275	29.95
8279 - 5	10.00
8282	6.60
8283	6.60
8284A	5.75
8286	6.60
8287	6.60
8288	25.00
8289	49.95
8755A	45.00
8748	30.00

4118
STATIC RAM
1K x 8
$15.00

6800

3242	8.00	
3480	9.00	
6800	5.75	
6802	11.00	
6809	25.00	
68B09	45.00	
6809E	36.00	
6810	3.50	
6821	3.50	
6840	9.00	
6843	41.00	
6845	22.00	
6847	12.25	
6850	3.50	
6852	3.50	
6875	7.00	
6880	1.80	
6882	4.70	
6885	1.80	
6888	1.80	
6889	1.80	
68488	12.50	

AUGAT LOW PROFILE SOCKETS

These Are High Reliability Industry Standard Sockets

8PIN	208-AG29D	.10
14PIN	214-AG29D	.16
16PIN	216-AG29D	.18
18PIN	218-AG29D	.20
20PIN	220-AG29D	.22
22PIN	222-AG29D	.24
24PIN	224-AG29D	.26
28PIN	228-AG29D	.28
40PIN	240-AG29D	.42

4164
64K Dynamic Ram
200 NS 16 pin
$15.00

Z80

Z8		50.00	
Z6132		40.00	
Z80		6.70	
Z80A		7.25	
Z80B		19.00	
Z80	PIO	6.00	
Z80A	PIO	7.10	
Z80B	PIO	15.50	
Z80	CTC	6.00	
Z80A	CTC	7.10	
Z80B	CTC	15.50	
Z80	DMA	18.50	
Z80A	DMA	22.50	
Z80	SIO/0	18.50	
Z80A	SIO/0	22.50	
Z80	SIO/1	18.50	
Z80A	SIO/1	22.50	
Z80	SIO/2	18.50	
Z80A	SIO/2	22.50	

6502

6502	7.90
6502A	10.00
6504	8.45
6504A	9.30
6512	9.20
6512A	10.00
6520	4.40
6521	6.15
6521A	6.70
6522	8.75
6522A	11.70
6532	11.25
6532A	12.40
6545 - 1	22.50
6545A - 1	28.95
6551	11.95
6551A	12.95

Microprocessor Crystals
$3.00 Each

3.579545MHZ	Parallel
4.0MHZ	Parallel
4.0MHZ	Series
5.0MHZ	Parallel
6.0MHZ	Parallel
6.144MHZ	Parallel
8.0MHZ	Series
10.0MHZ	Series
15.0MHZ	Series
18.0MHZ	Series
18.431MHZ	Series
48.0MHZ	Series

EPROMS

2708	AMD	3 Supply	45ONS	3.50
2716	Hitachi	+5	45ONS	7.00
2716	National	+5	45ONS	7.00
2716	Intel	+5	45ONS	7.00
2716-1	Intel	+5	35ONS	9.50
2716	T.I.	3 Supply	45ONS	7.50
2716	Motorola	3 Supply	45ONS	7.50
2732	NEC	+5	45ONS	16.00
2732	Mitsubish	+5	45ONS	16.00
2732	Intel	+5	45ONS	17.00
2732A	Intel	+5	25ONS	17.00
2732A - 2	Intel	+5	30ONS	16.00
2732A - 2	Intel	+5	20ONS	20.00
2532	Hitachi	+5	45ONS	18.00

master charge | VISA

We reserve the right to substitute manufacturers.
Prices subject to change without notice.
Our inventory is completely managed by computer.

HANLEY ENGINEERING CORP.

13400 Northup Way #20
Bellevue, WA 98005

800-426-2668
206-643-0792

Minimum Order 15.00
Include 4.00 for UPS Blue
Include 3.00 for UPS Ground
Include 4.00 for 1st Class Mail
Include 12.00 for Foreign Country Orders
Washington State add 5.4% Sales Tax

(from page 162)

used the Applesoft graphics commands will be able to understand Ampergraph commands readily, though they will probably have to consult the sample programs in the back of the manual. Beginners will find Ampergraph commands easier to learn than, say, Fortran commands; but they can count on a few hours of trial and error learning before they master the Ampergraph commands.

But the user's manual is not clear about one important point: the Ampergraph utility works only on page 2 of the high-resolution graphics. In other words, every program must contain the command HGR2. If either the low-resolution graphics or page 1 of the high-resolution graphics is used, the results are unpredictable.

Who could use Ampergraph? Anyone who would rather pay $25 for a graphing utility with hard-copy capabilities than spend hours writing custom programs with the frustrating Applesoft commands. That should include a lot of mathematicians, a lot of statisticians and a lot of businessmen.

But potential buyers should be aware of three weaknesses. As already mentioned, the only practicable printer for many users will be Apple's Silentype, a thermal printer which does not produce neat 20-pound-bond originals. Still, photocopies of the thermal originals are often acceptable.

Also, mathematical purists will be disturbed because the horizontal and vertical axes are not scaled on the same metric. In other words, an interval of (say) one centimeter on the x scale will not be an interval of one centimeter on the y scale. In some applications, this is a serious weakness, although it can be overcome by careful (and tedious) trial-and-error programming of the scales.

Finally, the printed copy, like the Apple CRT screen, is only 40 columns wide. There are occasions when a decent graph should fill a complete 8½ by 11 page (my own rule is that it is better to make a graph too big than to make it too small, although this rule may merely reflect the limited power of my bifocals).

So Ampergraph will give you ample graphing power—and that's it. You certainly can't complain about the price, and the limitations of the utility aren't that serious if all you're after is the occasional graph to complete a college term paper or a scholarly handout for next year's dull conference.

(Since this review, Madwest Software has come out with version 2.0. The only change in this new version is a provision for interfacing the utility to an Epson MX-80 or MX-100 printer. The interface requires a second utility, Amperdump (price, $30); I did not test this second utility, but it's supposed to provide printouts up to 7 × 8 inches in size—about 4 times the area of the printouts available from the original version. It is not clear from the documentation for Amperdump whether it will work with programs other than Ampergraph; if it does, it might be a helpful utility for users who want graphics output on their Epson printers.)
(Madwest Software, PO Box 9822, Madison, WI 53715. $30.)

Brownlee Elliott
Bloomfield Hills, MI

The Documenter

A TRS-80 program
Lets your computer
Create your flowchart

Flowcharts rarely accompany software. In fact, I've bought only one program that included a flowchart with the documentation.

The absence of a flowchart can cause problems if you want to make changes in the program without interrupting the program logic. The Documenter by P80NUT software (pronounced "peanut" or "double-Pnut") has approached this problem by providing a logical flowchart of any Basic program.

Once loaded, The Documenter runs through any Basic program in memory and produces a flowchart of the program. The flowchart is displayed on the CRT and can be printed. If you have a graphics printer such as the MX-80, the flowchart symbols are printed in graphic style. In the case of a nongraphic printer, the symbols are printed using characters such as : or ;. In addition to the flowchart output, The Documenter prints a list at the end of

What's a SemiDisk?™

The best disk emulator you'll find anywhere. It's a single 512K byte memory board. (1 Megabyte on special order) It operates like a disk, except far faster. Your software is compatible with no modifications.

No strings attached. No need for a special CPU, DMA, I/O, or disk controller. No need to return your operating system disk. No changes to your present hardware.

SemiDisk doesn't interfere with memory space, which is left totally free for the operating system or user programs. If you have an 8080, 8085, or Z80 CPU with CP/M 2.X on S-100, you can use it right now. (Available soon for TRS-80 Model 2 and IBM Personal Computer.)

Unmatched Performance:

- **30 to 300 times faster than 8" floppies**
- **Much faster than hard disks**
- **Expandable to 8 Megabytes**
- **Only 0.6 amps (typ) supply current for 512K (0.9 amps for 1 Megabyte)**

SemiDisk is the least expensive disk emulator per byte of storage. At $1995 for 512K, it's less than a third the cost of the closest competition.

So compare price, performance, hardware requirements, flexibility, storage density, and expandability, and you'll select SemiDisk!

SemiDisk Systems ↙375 P.O. Box GG Beaverton, OR 97075 (503)-642-3100

TRS-80 trademark of Radio Shack — CP/M Trademark of Digital Research

↙See List of Advertisers on page 130

the chart, including Branch From, Function and Branch To. Besides working with different printers, The Documenter lets you display continuously or one screen at a time. The same feature is available for the printer so that only those sections you want can be printed out. You can selectively chart by stating the line numbers to be charted.

The Documenter also lets you return to the Basic program any time you desire. You can then list or edit the program and return to The Documenter. The only restriction is that you cannot run the Basic program. That destroys The Documenter, which is not in protected memory.

```
10 REM TEST OF THE DOCUMENTER
20 REM START LOOP
30 FOR X = 1 TO 100
40 PRINT" THE DOCUMENTER "
50 REM STOP THE LOOP WHEN PRINT HAS BEEN DONE 10 TIMES
60 IF X < 10 GOTO 70 ELSE 80
70 NEXT X
80 STOP
```

DOCUMENTER OUTPUT

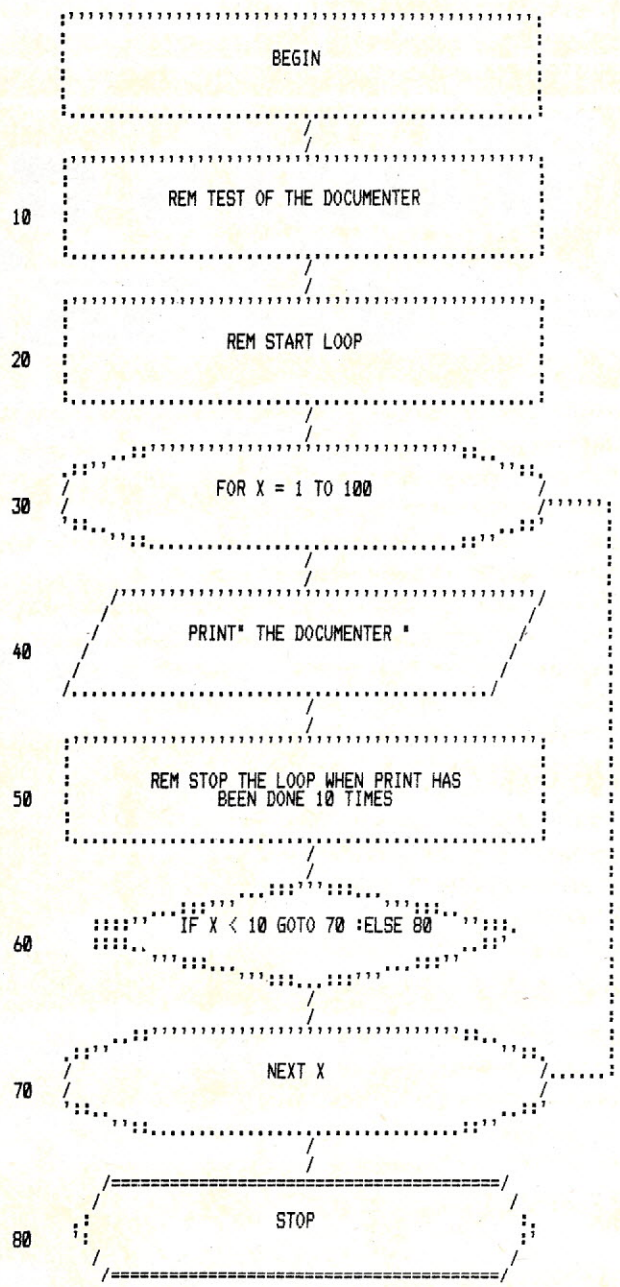


Fig. 1. Test program and flowchart.

I've noticed several problems with The Documenter. First, it won't run on my computer. I have a TRS-80 Model I Level II 48K with disk. My keyboard contains the very first Level II ROM. I don't know if that's the problem, but The Documenter will begin to run and then, after a short time, locks up. Luckily I have two computers, and when I exchange keyboards the program runs fine. The second keyboard contains the most recent Level II ROM.

Second, as the documentation notes, The Documenter only charts from the top down. It does not permit horizontal branches. This poses a few minor problems in the logic flow, but it can be overcome. It is certainly better than no flowchart at all.

Third, The Documenter is designed to run under TRSDOS 2.3; there are incompatibilities with NEWDOS80 on the Model III. I've used NEWDOS80 on the Model I, and The Documenter seems to function fine, but there may be some problems I haven't run into yet. In either case, the people at P80NUT are working on the problem, and expect compatibility to be complete soon.

Last, The Documenter obviously can't supply words for describing the program logic. It must depend on reprinting lines of code or REM statements from the program. In fact, what it does is take each line, determine its content and then print or display the line or part thereof inside the proper charting block. Since room in these charting blocks is limited, some of the code and REM statements may be cut off. This occurs in a most confusing manner in compressed programs or extremely long lines. The best way to avoid this problem is to unpack tightly-written programs with a utility such as Packer by Cottage Software.

Fig. 1 is a short Basic program and The Documenter's flowchart. The branch chart normally at the bottom of the print is not included since the program is so short.

"The Documenter" is a new program, and like all new programs it may still have a few bugs. I've talked to the people at P80NUT and they want to produce a good product.

As always, you should be certain that you need the program before you buy it. If you can use the aid of flowcharting for your programming, The Documenter may be what you're looking for. It's certainly an ingenious approach to program documentation.

(P80NUT Software, Box 490, Lilburn, GA 30247. $19.95 for 16, 32, or 48K tape, $29.95 for 48K disk.)

Richard C. McGarvey
Wiliamsville, NY

Mychess

For the Heath micros:
A chess program
That ranks with the best

When considering a chess program, the first, and perhaps most important, feature is the strength of play. Based on tournament time limits (40 moves in two hours), Mychess for the Heath has a United States Chess Federation (USCF) ranking of 1568 (the average ranking is about 1400). Mychess won the fifth West Coast Computer Faire (1980) tournament, and was the top finisher among microcomputers in the tenth ACM North American Computer Chess Championship (1979).

I've played many games against Fidelity Electronics' Chess Challenger 10 and Sargon I, and Mychess is a stronger opponent. In fact, when Mychess is playing at one of its higher levels, most people would consider it unbeatable.

The skill level of Mychess ranges from 1 to 9. This number is the ply level, or the number of half moves that the program looks ahead. The speed with which Mychess moves is, of course, related to the selected skill level. At level 1, Mychess takes about 5 seconds per move, at level 2 about 15 seconds, at level 3 about 40 seconds and at level 4 about 4 minutes. It will play about 6 times slower at each additional level. This means levels 5 through 9 are extremely slow and not very practical. Strong-playing, but slow, levels are common to almost all computer chess programs.

Mychess uses the standard algebraic notation to represent each square. With this method each row is numbered 1 through 8 and each column is labeled A through H. These numbers and letters are used as the column-row coordinates for each square (white's king's pawn begins on square E2). After you've been prompted to enter your move, you simply key the coordinates of the square containing the piece to be moved, followed by any character (usually a hyphen) and the coordinates of the square to which the piece is to be moved. Any mistakes can be corrected by using the backspace key. Striking the return key will tell Mychess to process the move.

When Mychess moves a piece or pieces, it erases the piece from its current square and redisplays it at its new square, removing any piece which might have been captured. Of course, Mychess will not accept any illegal moves. When Mychess makes a move it will sound a "beep" on the speaker to notify the user. This is a helpful feature especially when playing on one of the slower levels.

This version of Mychess makes excellent use of the H89/H19 graphics. The board is positioned on the left side of the screen and occupies the full length of the screen (25 lines) and about two-thirds of the width (52 columns). Two columns on

BUYING?

You can save on computers and software using our commercial buying service. We buy wholesale for you. Our fee is one fourth of what we save you off list. We offer you:

- Access to over 500 Manufacturers
- 1500 Satisfied Clients
- Leasing
- Exporting Services

Examples of prices paid by our clients (including fee) are:

Computers

Adds Multivision	$ 3,075.00
Adds Multivision I	3,074.00
Alpha Micro 1030	12,047.00
Alpha Micro 1051	17,634.00
Alspa AC1-2/SS	2,320.00
Altos 8000-02	2,629.00
Altos 8000-10	**6,141.00**
Altos 8000-15	3,585.00
Altos 8600-10	7,586.00
Apple 2 + 48K	1,208.00
Archives Model I	4,700.00
CCS Series 300-1A	4,414.00
Cromenco System 0	3,200.00
Cromemco System 1	2,946.00
Cromemco System 2	3,400.00
DEC VT-180xx	**3,344.00**
Dynabyte	30% OFF
IBM Personal	CALL
Micromation	CALL
NEC 8001A	750.00
NEC 8012A	490.00
NEC 8031A	750.00
North Star Advantage	**2950.00**
North Star Hoz II 64K DD	2,995.00
North Star Hoz II 64K QD	3,040.00
Onyx 5001 MU-6	7,350.00
Osborne	CALL
Seattle System 2	3,251.00
Televideo TS-802	2,600.00
Televideo TS-802H	5,000.00
Televideo TS 806	5,100.00
Toshiba T-200 w/Printer	4,099.00
Toshiba T-250 w/Printer	5,099.00
Toshiba EW-1000/4	6,799.00
Toshiba EW-1000/2 w/Ptr	5,999.00
Vector 2600	4,221.00
Vector 3005	6,458.00
Vector 5005	7,308.00
Wicat	CALL
Xerox 820 5¼	2,300.00
Xerox 820 8"	2,900.00

Printers

C. Itoh F-10	1,400.00
C. Itoh 40 CPS Serial	1,500.00
C. Itoh 45 CPS Par	1,675.00
C. Itoh Comet II	800.00
Diablo 630	1,965.00
IDS 560	1,099.00
IDS Prism 132 Column	1,395.00
NEC 3510	1,830.00
NEC 7710 R/O	2,325.00
NEC 7720 KSR	2,700.00
NEC 8023	603.00
Olivetti 231	2,104.00
Qume 9/35	1,795.00
Qume 9/45	2,045.00
Sellem 1	2,725.00
Tally	CALL

Others

Anderson Jacobsen	641.25
Corvus 10MEG	3,825.00
DEC VT-100	1,430.00
Houston Instrument DMP-2	1,147.00
Houston Instrument DMP-4	1,460.00
Houston Instrument DMP-7	2,077.00
Morrow 20MEG	3,650.00

For latest wholesale prices and to order Call Toll Free 800-227-2288. In California call 415-376-9020. Assembly, integration and testing also available from our service department.

Ask about our Leasing Program. We are buying agents for overseas computer dealers. **EXPORT SERVICES available.** International Telex 470851.

Mastercard, VISA at 3% handling fee. Prices subject to change without notice. Minimum fee $100. 15% cancellation fee.

THE PURCHASING AGENT ↙98

1635 School St., Suite 101, Moraga, CA 94556

↙See List of Advertisers on page 130

the left side of the board and two columns on the right are used to display the numbers (1–8) representing the board's rows. The bottom line is used to display the characters (A–H) used to represent the board's columns. This labeling is helpful during the game because the user doesn't waste his time counting rows and columns when entering his move. The squares of the board are solid black and white.

The pieces are well-defined and look much like standard chess pieces. The method that Mychess uses to display a white piece on a white square and a black piece on a black square is nicely done and not at all confusing.

The moves made by both players are displayed on the right third of the screen. When it's your turn to move, you are prompted by the words "You play:" followed by the move number. Mychess then makes its move and on the next line prints "I play:" followed by the move number, the string "— —" and the notation for its move. Immediately to the right of its move, "check" will be printed if its move has indeed placed the user in check. Because of the limited amount of space available, the moves are bunched together, giving them a cluttered look and making them somewhat difficult to read.

Another feature of Mychess is the ability to set up a board position. If you decide to use this feature, Mychess will display the board setup for the beginning of a game. You must then enter as many moves as is necessary to arrange the board. These moves may be illegal, but the receiving square must be occupied. A piece may be removed from the board by entering its square and no receiving square. When the board has been set up as desired, typing the return key will get you out of this mode. Mychess will ask for the castling status of each side, and the move number.

Setting up a board position is always somewhat cumbersome, but this method deals rather well with the situation. However, if you accidentally remove a piece, you can't put it back. A more practical method would be to start with an empty board and have you enter a square's coordinates and a code indicating the type of piece and its colors. By entering a square's coordinates only, you could remove a piece that has been incorrectly positioned. This method would not only reduce the number of entries, but would also allow you to easily correct any mistakes. Some additional program code would be required for this method, making the program larger, whereas the current method being used by Mychess can make use of existing "move" routines.

Mychess also uses time controls. You can tell Mychess to make the first 40 moves in 120 minutes and the next 20 moves in 60 minutes, thus simulating actual tournament play. You must keep track of the time, and Mychess will occasionally ask how much time it has remaining. Mychess will play at the 4 ply level but will drop to level 3 if time becomes a factor. Time controls make the game seem more realistic; however, it would be even more realistic if the program could keep track of the time for both players.

One very important feature of Mychess is your ability to force Mychess to make a move. By entering "GO" while Mychess is determining its next move, you can tell it to make the best move that it has found up to that point. This is useful when playing at one of the higher levels, as most people have neither the time nor the patience to play a five hour game.

Other command options let you make more than one move at a time, switch places with Mychess and make Mychess play against itself. Although these options are not part of a normal game, they let you use Mychess as an instructional tool.

The final options available to you are the ability to record the moves on a printer and the ability to have Mychess tell you what sequence of moves it considers best.

MONEYGO®

for Apple computer with Applesoft and DOS 3.3

The Versatile, Complete
PERSONAL BUDGET PROGRAM
with the unique CROSS-REFERENCE FEATURE!

Extract and summarize the info you need to —
- Claim all those tax deductions
- Reconcile your bank statement
- Determine when repairs exceed replacement costs
- Locate proof of expenditure
- Analyze your spending habits — lots more!

MONEYGO has NO RESTRICTIONS on number of categories or length of entry!

THE TOP PROGRAM IN ITS FIELD!

HANDLES CHECK ACCOUNTS, CHARGE CARDS, CASH, BANK TRANSFERS ... all transactions!

flexible to fit your needs ... even subcategorizes income and expenses for each member of your family! Stores over 3000 records per disk ... printout capabilities ... totals SALES TAX automatically ... flags tax deductibles from all categories! And MONEYGO was user tested for two years prior to national marketing!

MONEY GO® floppy disk program & complete documentation

only $45 (includes shipping)
TN residents add 4½% sales tax

KEY SOFTWARE
P.O. Box 3092
Oak Ridge TN 37830

Apple and Applesoft are registered trademarks of Apple Computer Co.

✓ 54

CRC PUBLISHING BRINGS YOU AN EXCLUSIVE
IBM* Personal Computer JOURNAL

SOFTWARE REVIEWS
HARDWARE REVIEWS
NEW PRODUCT ANNOUNCEMENTS
TECHNICAL ARTICLES
PROBLEM REPORTING
FORUM
VENDOR DIRECTORY
CLASSIFIED ADS
OWNER INFORMATION EXCHANGE

Subscriptions $18 for 12 issues. Sample copy $2.
Send check or money order to

CRC Publishing ✓ 370

10057 Commerce Avenue, Dept. K, Tujunga, CA 91042
*Registered Trademark of IBM Corp.

One very impressive fact about Mychess is that it will predict its opponent's next move and begin determining its reply while it is waiting for the opponent to enter his move. This is a feature that many microcomputer chess programs lack.

If you're looking for a chess program to add to your microcomputer system, I think you'll be pleased with Mychess.

(The Software Toolworks, 14478 Glorietta Drive, Sherman Oaks, CA 91423. $34.95. Available for HDOS and CP/M; requires 48K of memory.)

Frank Bowers
Blacksburg, VA

Diagnostics II

A program for CP/M Lets your computer Diagnose its own ills

The idea of letting my computer diagnose its own ills fascinates me. My limited programming ability, though, has held me back. I've continued to rely on the tools of the hardware hacker—schematics, a soldering iron and an oscilloscope. Supersoft's Diagnostics II for CP/M-based systems has changed this.

Diagnostics II consists of 15 programs, which are called as CP/M.COM files. For instance, to run the first memory test, you simply enter MTEST; the program loads and then executes. (I'm annoyed, though, that Supersoft uses a menu type program but doesn't produce a menu on the screen.)

Supersoft uses two gimmicks. First, a disk file contains a copy of the manual. This can be read by the CP/M TYPE command. The second is the HELP.COM file, which is a menu-driven companion to the program. Supersoft certainly plays this up in its ads. Unfortunately, when I tried to run it in a 40K CP/M system, the error message showed that the program exceeded my memory. I expanded to 48K with the same result. In desperation I borrowed 12K and tried to run the program with 60K. Again, no luck. Since I consider these features to be superfluous, I haven't bothered to complain to Supersoft. This problem does show a lack of care on the manufacturer's part, since Diagnostics II is supposed to run on a 32K CP/M system.

Supersoft includes two memory tests, MTEST and MTEST2. As anyone else who owns 48K of Processor Technology's dynamic programmable random access memory (RAM) will know, testing memory is an essential part of computing. Collecting memory test programs becomes a hobby in itself; writing memory test programs becomes an obsession.

MTEST2 is the simplest to explain. It is a relocated version of MTEST that tests the area of memory that would normally be filled with MTEST. Unfortunately, I don't know how well it works since every time I start it, it hangs up with the message that drive C is not up. This is very observant of it, since I don't own a third drive. I haven't bothered with this problem; I assume that since MTEST works, the memory in which it resides must work, too.

MTEST consists of four memory tests.

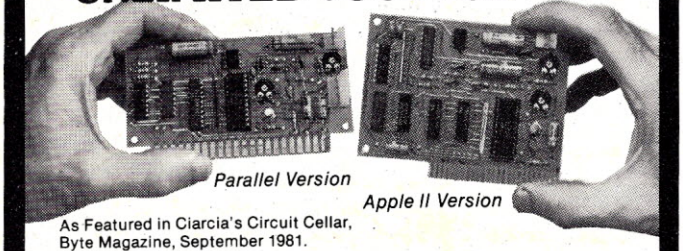
The quick test tests memory one byte at a time. An address is written to and read from; if there is no error, the program moves on to the next byte.

The walking test is much more comprehensive and therefore much longer. It takes 13 hours to test 16K. In this test, not only is the addressed byte written to and read from, but all the other bytes are read from to make sure that they were not affected by operations on other bytes.

A third burn test is meant specifically for dynamic memory and picks up afterimages. My flaky memory is certainly a challenge for any memory test, so I can reassure any user that the quick test is sufficient to pick up any but extremely subtle errors.

The final test is meant to tell whether

SWEET-TALKER, IT GIVES YOUR COMPUTER AN UNLIMITED VOCABULARY.



As Featured in Ciarcia's Circuit Cellar, Byte Magazine, September 1981.

The Sweet-Talker voice synthesizer allows you to add speech of unlimited vocabulary to your computer. Utilizing the Votrax SC-01A chip, you can output any message by programming individual phonemes. Comes in two versions; one plugs directly into your Apple II, the other connects to any computer with an 8-bit parallel printer port. + 12 volts and + 5 volts required for parallel board.

- Contains 64 different phonemes accessed by a 6-bit code.
- Automatic and manual inflection modes.
- Parallel port driven or plug-in compatible with Apple II.
- Super text-to-speech algorithm on disk for Apple II. Makes Sweet-Talker equivalent to units 3 times the cost.
- On board audio amplifier
- Sample program on cassette with Apple II board.
- Optional power supply for parallel board.

ST01	Sweet Talker Parallel Port Board A & T $139.00
ST02	Sweet Talker Apple II plug in board 149.00
ST06	Text-to-Speech algorithm on disk for Apple II 35.00
SC01A	Votrax Speech Synthesizer chip ..... 70.00 5 or more ..... 55.00 each
UPS01	Universal Power Supply-A & T 35.00

Add $2.00 for shipping & handling.

To Order: Call Toll Free 1-800-645-3479
(In N.Y. State Call: 1-516-374-6793)
For Information Call: 1-516-374-6793

MICROMINT INC.
917 Midway
Woodmere N.Y. 11598

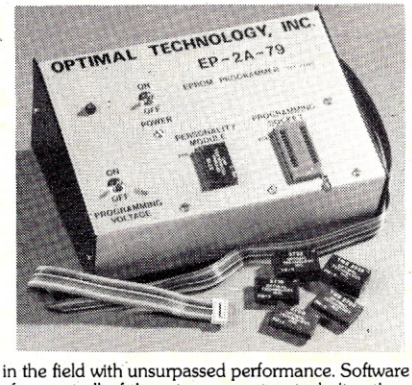
MICRO MINT

✓347

Model EP-2A-79

EPROM Programmer

North Star
Apple
S-100
SS-50
STD-Bus
Atari
Pet
Kim-1



TRS-80
H-8
H-89
Ohio Scientific
SWTP
Aim-65
Sym-1

Three years in the field with unsurpassed performance. Software is available for the EP-2A-79 for most all of the microcomputers including the popular CP/M, FLEX, HDOS operating systems. Write or call for specific hardware/software interfacing. Driver packages available for F-8, 6800, 6809, 8080,8085, Z-80, 1802, 6502 and 2650 based systems.

EP-2A-79 115V 50/60 HZ $169.00

Personality Modules

PM-0	TMS 2708	$17.00	PM-5	2716, 2758	$17.00
PM-1	2704, 2708	17.00	PM-5E	2816	35.00
PM-2	2732	33.00	PM-8	MCM68764	35.00
PM-2A	2732A	33.00	PM-9	2764	35.00
PM-3	TMS 2716	17.00	SA-64-2	TMS 2564	39.00
PM-4	TMS 2532	33.00	SA-64-3	2764	39.00

Optimal Technology, Inc. ✓29

Phone (804) 973-5482
Blue Wood 127 Earlysville, VA 22936

✓See List of Advertisers on page 130

Enjoy The

SEX-PLOSION

Subscribe Today Take a break from the space wars and shoot 'em ups. The Dirty Book will bring you the latest collection of bedroom programs and games geared to creative, joyful living and loving. Here's a great opportunity to chart your own course to greater intimacy and satisfaction in the months to come.

The Dirty Book

Read how your fellow computerists enjoy these zesty programs.

- **French Post Cards • Bedtime Stories**
- **Dirty Old Man • Animated Comics**
- **Encounter • Interlude • Pornopoly**
- **Sex Disk • Softporn • Whatzee**
- **Wanna Play Footsie? • Zesty Zodiacs.**

Here's A New Contest You'll Love To Enter! Submit your favorite micro-computer game program to the "Dirty Book" contest. You can win an expense-paid trip to fabulous New Orleans and enjoy the exciting French Quarter and all that jazz. The "Dirty Book" will expose your bedtime games and programs to thousands of prospective buyers. Write for full details.

Bourbon Street Press
3225 Danny Park, New Orleans
(Metairie), LA 70002 (504) 455-5330
(You must be of legal age to enter subscription)

Name

Company (if any)

Address

City

State Zip

Charter Subscription
1 yr. 4 issues @29.95
Single issue @9.95
Dealer Inquiries or Call in Orders
Bourbon St. Press (504) 455-5330

Check enclosed
COD — Company Only
PO#
Visa or
MC#

Signature Expiration Date

326

Supersoft has developed a very useful group of programs, which are useful to hardware freaks like me.

your memory is running at 2 or 4 megahertz.

All memory tests will handle bank-select boards.

The program displays instructive messages when it finds a memory error. From this information, any competent electronics hobbyist should be able to correct the problem. You can even save error messages on disk. This way, you can leave the program running unattended and read the results later (remember the 13-hour memory test?).

Supersoft is prouder of their central processing unit (CPU) test than the routine justifies. Their ads say it's the only diagnostic routine that tests the CPU. Can there be a hidden message there? If there is anything seriously wrong with the CPU, you can't load, let alone run, the program. Supersoft, however, says that some seldom-used op codes may misfunction without your knowing it. So be it.

The test starts by telling you what type of processor you have. If you aren't sure of this to start with, you don't belong under the cover with a screwdriver. The program shows that I have either an 8080 or an 8085. Then a timing routine determines the speed of the machine. Again, it's of limited use.

To my surprise, the screen message told me that my F register was not working. Fortunately, being a hardware hacker, I realized that the 8080 has no F register. A peek at the manual showed me that the F register really is the program status word (PSW). So why not say so on the screen? Examination of the error message showed that the program was trying to change bits in the PSW that can't be changed in the 8080.

Further along, the manual informed me that the CPU test could hang up on this problem. Although a fix is suggested, it shouldn't be tried if you aren't familiar with assembly-language programming. I understand this problem has been corrected in an update Supersoft is now offering for $25.

The disk test is the best of the package. A pattern of bits is written to the disk in either a random or user-determined order and then read back. You determine which tracks and sectors are to be tested and in which order.

I'm annoyed that you must use decimal notation here while the memory tests use hexadecimal addresses. This may not sound like much, but it smacks of amateurism. Use a formatted, empty diskette for this test: the program destroys any material saved on the disk.

Once again, there are many helpful error messages. Give Diagnostics II and 3M's disk cleaning kit to your disk drives as a peace offering.

The printer test seems versatile. I unfortunately don't own a daisywheel printer, but, if the program tests them as well as it does my standard Selectric printer, you have nothing to worry about.

Finally, you test your terminal. To anyone who knows the hardware and software mechanics of his system, it's a snap. However, the options that you must supply will be very confusing to anyone who doesn't know these things. Even Supersoft's usual hand-holding won't help here.

The program requires a data file with the details of your specific terminal. The maker has included files for the Soroc, ADM-3, Hazeltine 1500 and ADDS Regency terminals. If you have another one, you must create your own file the first time you use the program. The manual and screen prompts are explicit, but you must know many technical facts about your terminal, such as the hex sequence for load cursor position and the decimal value for the top line of your display. I know these for my terminal, but do you know them for yours? If Lifeboat Associates can supply configured forms of their CP/M software, I don't know why Supersoft can't do the same.

Enter QRUN and you're into the quick test. First, it tests all memory in the transient program area (TPA) of CP/M. Then, a quick disk check is done and finally the CPU test executes. There are two problems. First, no one tells you what the quick disk test does to the disk in the drive. In fact, the test does not destroy any data, but I wish Supersoft had reassured me about this first.

The second problem is my old friend, the CPU test. It always hangs up with the statement that the F register isn't working! But I wouldn't consider using my computer without first running this test.

My one complaint is quality control. Software manufacturers rightly complain that we hobbyists resist paying realistic prices for professional software. I, however, resent it when I pay and then get a program in which two of the programs don't work. I burn when I later get a letter advising me that I can correct those errors by buying an update that costs one quarter of the original package.

Supersoft has developed a very useful group of programs. They have shown their usual care in the writing of the manual and, as usual, lead you through each step by the hand. The program is useful to hardware freaks like me, and it would be useful to any repair shop. The quick test is invaluable as something to be run

before you start using the computer every day.

(Supersoft Associates, Champaign, IL 61820. $99.)

Bruce R. Evans
Pickering, Ontario

Print II

This Apple utility
Lets you format
For numerical output

Computer journals have published many articles that extend the capabilities of various computer languages. One such extension to Applesoft is a formatting feature for numerical output (see, for example, *Micro*, Vol. 27, 1980, or Call A.P.P.L.E. In Depth, Vol. 1, 1981). Some versions of Basic refer to this as a Print Using statement, a statement that allows a value to be printed using a specified format. The Print II utility by Computer Systems Design adds just such a formatting capability to Applesoft, and also provides for cursor positioning from within a Print statement.

Print II is a machine-language routine that is loaded just below DOS. Applesoft recognizes three new forms of the Print command, including Print For, Print # and Print At. The Print For statement lets you designate a format to be used for subsequent numeric output. This includes the specification of the total number of digits to be output and the number of digits to the right of a decimal point. In addition, you can specify a leading character ($, #, %, or '). Another option lets you replace leading blanks with asterisks. Once specified, a format can be reused repeatedly in Print statements by preceding a numeric expression in a Print statement by the symbol #. The format can be changed by issuing another Print For. The Print At statement allows X, Y cursor positioning from within a Print statement.

Essentially, the Print II utility lets you output numeric values according to a specified format at a selected cursor position. These capabilities greatly simplify the display of tables of values. Also, though it is not mentioned in the brief documentation that accompanies the Print II package, these commands can be used for output to a printer, with values printed according to the specified format and horizontal tabulation determined by the Print At command (vertical tabulation is ineffective with printer output).

Print II is supplied on a DOS 3.2 disk (it can be muffined to DOS 3.3), which contains programs to customize Print II for specific memory configurations and several simple demonstration programs.

Print II lacks the versatility in print formats that are available in some forms of the Print Using statement, but it is easy

- This latest issue features professional software reviews on **electronic worksheets, word processors, accounting,** and more.
- Convenient shopping at low mail order prices...Packed with facts that give you the extra savings of smart product selection.
- Unique installation, systems, and format charts assure you'll choose software that is easy to run on your configuration.
- Our analysis of competing products help you to find the best software for your particular needs.
- This unusual catalog contains over 15,000 words of succinct, hard-to-find data...and you'll be on our list for future catalogs as they are published.
- Rush your request today and avoid the delays of catalog re-runs. There's no obligation.

Send for your FREE catalog today!

KM0382

Dedicated Systems ✓34
CORPORATION

☐ Send me SELECTED SOFTWARE FREE of charge.

(Please Print)
NAME: _____
ADDRESS: _____
_____
CITY/STATE/ZIP: _____
_____
DISK SIZE: ☐ 8" ☐ 5.25"
SYSTEM: _____ RAM: ___ K
TERMINAL: _____ PRINTER: _____

Mail to:
DEDICATED SYSTEMS CORPORATION
2440 E. Commercial Blvd., Suite 4
Fort Lauderdale, FL 33308

CP/M is a registered trademark of Digital Research.

$ SAVE $

Software at SUPER DISCOUNT PRICES

the best available on the market today for

TRS-80

apple computer

ATARI

GAMES ★ UTILITIES ★ BUSINESS
for the budget minded individual

ONE OF THE WORLD'S LARGEST INVENTORIES

We have all the latest software—ASK US!

A-BARGAIN Distributors
COMPUTER GAMES SPECIALISTS
✓314
P.O. BOX 24121 – C
OAKLAND, CA 94607

✓See List of Advertisers on page 130

FOR TRS-80 MODEL I OR III AND SOON FOR THE NEW IBM PERSONAL COMPUTER!

★ **MORE SPEED**
10-20 times faster than Level II BASIC.

★ **MORE ROOM**
Very compact compiled code plus VIRTUAL MEMORY makes your RAM act larger. Variable number of block buffers. 31-char.-unique word-names use only 4 bytes in header!

★ **MORE INSTRUCTIONS**
Add YOUR commands to its 79-STANDARD-plus instruction set!
Far more complete than most Forths: single & double precision, arrays, string-handling, clock, more.

★ **MORE EASE**
Excellent full-screen Editor, structured & modular programming
Word search utility
THE NOTEPAD letter writer
Optimized for your TRS-80 or IBM with keyboard repeats, upper/lower case display driver, full ASCII, single- & double-width graphics, etc.

★ **MORE POWER**
Forth operating system
Interpreter AND compiler
8080 or 8088 Assembler
(Z80 Assembler also available for TRS-80)
Intermix 35- to 80-track disk drives
Model III and IBM can read, write and run each other's and Model I diskettes!
VIRTUAL I/O for video and printer, disk and tape
(10-Megabyte hard disk available)

MMSFORTH

THE PROFESSIONAL FORTH FOR TRS-80

(Thousands of systems in use)

MMSFORTH Disk System V2.0 (requires 1 disk drive, 32K RAM) For Radio Shack TRS-80 Model I or III **$129.95**
For IBM Personal Computer (advance order) ... **$249.95**

AND MMS GIVES IT PROFESSIONAL SUPPORT

Source code provided
MMSFORTH Newsletter
Many demo programs aboard
MMSFORTH User Groups
Inexpensive upgrades to latest version
Programming staff can provide advice, modifications and custom programs, to fit YOUR needs.

MMSFORTH UTILITIES DISKETTE: Includes FLOATING POINT MATH (L2 BASIC ROM routines plus Complex numbers, Rectangular-Polar coordinate conversions, Degrees mode, more), plus a full Forth-style Z80 ASSEMBLER; plus a powerful CROSS-REFERENCER to list Forth words by block and line. All on one diskette (requires MMSFORTH V2.0, 1 drive & 32K RAM) . **$39.95***

FORTHCOM: communications package provides RS-232 driver, dumb terminal mode, transfer of FORTH blocks, and host mode to operate a remote TRS-80 (requires MMSFORTH V2.0, 1 drive & 32K RAM) **$39.95***

THE DATAHANDLER V1.2: a very sophisticated database management system operable by non-programmers (requires MMSFORTH V2.0, 1 drive & 32K RAM) **$59.95***

MMSFORTH GAMES DISKETTE: real-time graphics & board games w/source code. Includes BREAKFORTH, CRASHFORTH, CRYPTOQUOTE, FREEWAY, OTHELLO & TICTACFORTH (requires MMSFORTH V2.0, 1 drive & 32K RAM) **$39.95***

Other MMSFORTH products under development

FORTH BOOKS AVAILABLE

MMSFORTH USERS MANUAL - without Appendices, for non-owners **$17.50***

STARTING FORTH - best companion to our manual **$15.95***

THREADED INTERPRETIVE LANGUAGES - advanced, excellent analysis of MMSFORTH-like language, ... **$18.95***

PROGRAM DESIGN & CONSTRUCTION - intro. to structured programming, good for Forth **$13.95***

FORTH -79 STANDARD MANUAL - official reference to 79-STANDARD word set, etc **$13.95***

FORTH SPECIAL ISSUE, BYTE Magazine (Aug. 1980) -we stock this collector's item for Forth users and beginners **$4.00***

* - ORDERING INFORMATION: Software prices include manuals and require signing of a non-transferrable single system, single-user license. Describe your Hardware. Add $2.00 S/H plus $3.00 per MMSFORTH and $1.00 per additional book; Mass. orders add 5% tax. Foreign orders add 20%. UPS COD, VISA & M/C accepted; no unpaid purchase orders, please.

Send SASE for free MMSFORTH information.
Good dealers sought.

Get MMSFORTH products from your computer dealer or

MILLER MICROCOMPUTER SERVICES (K5)
61 Lake Shore Road, Natick, MA 01760
(617) 653-6136

↙255

to use and should be sufficient for many applications.

(Computer Systems Design, 906 N. Main St., Wichita, KS 67203. $29.95.)

Larry P. Gonzalez
Chicago, IL

Full Disk Sort/Merge

A package for 6800s
Offers sorting capabilities
At a reasonable cost

Full Disk Sort/Merge from Star Kits is a disk file sorting program that handles files up to full disk capacity and creates a new sorted file. It is designed for the 6800 system using dual Percom disk drives and Super Basic.

The program itself is written in Basic and is easily converted to other versions of Basic or disk operating systems. While it runs slower than the available machine-language packages, it is available at a reasonable cost and is easily modified by the user.

The comprehensive documentation begins by defining files, records, fields and the key to the sort. The program is described in enough detail for a beginner to easily use it the first time it is run.

Sort/Merge organizes disk data into a sequence specified by the user. The program is useful for organizing business data, experimental results, mailing lists, record collections, libraries and inventories.

Sort/Merge can sort a data file of up to ten fields per record. This value can easily be changed. The file is sorted with a sorting key you define. This can be any combination of fields with numeric or string data. The fields can be sorted in increasing or decreasing order.

File definition is the first stage of the program. It asks for the name of the source file to be sorted, the number of fields in each record, type of field (numeric, string or any combination), the manner in which the sort is to be structured (up to ten fields) and if specific data should be selected or deleted from the sort.

The input disk is placed in drive 1 and a blank, but initialized, disk is placed in drive 2.

The efficient Shell-Metzner sort routine forms the main program. Small files are sorted in memory in a single operation. A 32K system will sort 50 records, of four fields, in memory with no need to merge files.

Files too large for memory are broken into smaller segments. These are individually sorted and combined (merged) into longer segments. This process continues until a single sorted file results. The merging operation requires two disk drives if the files are larger than half the capacity of the disk.

Once the file is sorted, a new file is written on a separate disk. Sort/Merge never updates a file in place; rather, a new file is created. This is especially desirable in critical applications to protect the data from being lost by a system failure or an operator error.

The Full Disk Sort/Merge package is delivered on a single 5-¼ inch disk. Along with the fully documented source program and the detailed instruction handbook, there are three test files and a print utility to show the results of the test files after they are sorted.

Since the files are ASCII data created by Basic or an editor, the only restriction is that a comma must be used as the field delimiter and not part of the data. Also, since the files are ASCII, data in lowercase characters will appear after data in uppercase characters.

To get an idea of the time required by the program to sort a file, I sorted a ten record file of three fields in a single operation in 20 seconds. A 100-record file of five fields was sorted on two fields; this required four minutes to sort and 1½ minutes to merge into the finished file.

Star Kit's Full Disk Sort/Merge program is a worthwhile investment for anyone who uses disk data files that must be sorted into a determined order for easier analysis.

(Star Kits, PO Box 209, Mt. Kisco, NY 10549. $35.)

Dennis Doonan
Racine, WI

Inventory Management System

An inexpensive package
If your business
Can live with its restraints

At the top of a businessman's pile of worries, you'll always find inventory. No matter what business you're in, if you don't have what a customer wants to buy, when he wants to buy it, you might as well close up shop.

But the paperwork! The time! The trouble!

So, when microcomputers came rolling off the assembly lines, many businessmen were waiting to buy one, eager to let their new Apple or PET or TRS-80 handle all of those inventory problems.

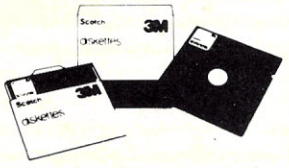
This is terrific, if the businessman is able to program his own inventory system. But what about the guy who doesn't know a byte from a ROM and doesn't want to?

Hayden Book Company, along with JACC, Inc., had this businessman in mind when they produced a $175 program for the Apple called the Inventory Management System for Stock Control.

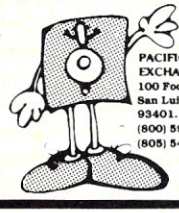
IMS tells you what you have in stock, what's selling well (and what isn't), what you're out of and so on, and can handle

Scotch® Diskettes

Rely on Scotch® diskettes to keep your valuable data safe. Dependable Scotch diskettes are tested and guaranteed error-free. The low abrasivity saves your read/write heads. They're compatible with most diskette drives.



(800)235-4137



PACIFIC EXCHANGES
100 Foothill Blvd
San Luis Obispo, CA
93401. In Cal. call
(800) 592-5935 or
(805) 543-1037

Dealer Inquiries Invited

↙172

— Professional —

REAL ESTATE SOFTWARE

for APPLE, TRS-80 + PET

- **PROPERTY MANAGEMENT SYSTEM: $325**
  - Tenant History
  - Late Rent Report
  - Vacancy Report
  - Income Report
  - Auto Late Charge
  - Returned Checks
  - Ownership Files
  - Building Reports
  - Utilities Report
  - Tax Expense Report
  - Prints Checks
  - Prints Receipts
- **PROPERTY LISTINGS/COMPARABLES: $325**
  - SCREEN BY →
    - 22 Items/Listing
    - 1000 Listing/Disk
    - Listing Memo Field
    - Max/Min Price
    - Units/Zone/City
    - Max Price/Income
    - Max Price/Sq Foot
    - Min Cashflow
- **REAL ESTATE ANALYSIS MODULES: $40/Module**
  - Home Purchase
  - Income Prop Analysis
  - Property Sales
  - Construction Cost/Profit
  - Tax Deferred Exchange
  - APR Loan Analysis
  - Loan Amortization
  - Depreciation Analysis
- **WORD PROCESSOR — MAGIC WAND: $285**

Software Realty Company™

At Computer Stores Everywhere or Order COD Direct
Cal Residents add 6% Sales Tax
(213) 372-9419

Suite F, Dept K 1116-8th St., Manhattan Beach, CA 90266

---

more . . . SPECTACULAR OFFERS

BASF · WABASH · MAXELL · OPUS

We stock the complete line of BASF diskettes, reel-to-reel tapes, mag cards, disk packs and cartridges. We also carry MAXELL, OPUS and WABASH products. All are 100% certified and fully guaranteed.

Box of 10 diskettes:	5¼"	8"
OPUS ss/sd	$20	$21
BASF ss/sd	23	24
WABASH ss/sd	23	24
MAXELL . TOO LOW TO QUOTE.	CALL	

5¼"-10 sector-now available
Sectoring must be specified.

5¼" or 8" Vinyl Storage Pages . . . . . 10/$5

LIBRARY CASES

8" Kas-sette/10 . . . . . $2.99
5¼" Mini Kas-sette/10 . . $2.49

HARDHOLE DISK PROTECTORS

Reinforcing rings of tough mylar protect disk hole edge from damage.

	5¼"	8"
Applicators	$3	$4
Hardhole Rings (50)	$6	$8

DISK DRIVE HEAD CLEANING KITS

Prevent head crashes and ensure error-free operation.
5¼" or 8" $19.50

SFD C-10 CASSETTES . . . . . 10/$7
(All cassettes include box and labels.)

Get 8 cassettes, C-10 Sonic, and Cassette/8 Library-Album, as illustrated, for only $8

SNAP-IT POWER CENTER

Turns 1 outlet into 6. Wall mount or portable. Circuit breaker, lighted switch and UL approved.
4"x3"x2" $19.95

We also offer printer ribbons, printwheels, type elements, equipment covers, power consoles, paper supplies, storage and filing equipment, furniture and many other accessories for word and data processing systems. Write for our free catalog.

VISA • MASTERCHARGE • MONEY ORDERS • CERTIFIED CHECK • FOR PERSONAL CHECKS ALLOW TWO WEEKS • C.O.D. REQUIRES A 10% DEPOSIT • CAL. RES. ADD 6% SALES TAX • MIN $2 SHIPPING & HANDLING • MINIMUM ORDER $10 • SATISFACTION GUARANTEED OR FULL REFUND

ABM PRODUCTS

↙273

8868 CLAIREMONT MESA BLVD.
SAN DIEGO, CALIFORNIA 92123

Toll Free 800-854-1555 Order Only
For Information or California Orders
(714) 268-3537

TRS-80 MODEL I T.M.* GOLDPLUG - 80

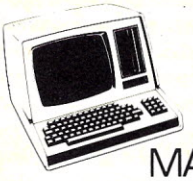
Eliminate disk re-boots and data loss due to poor contact problems at card edge connectors. The GOLD PLUG - 80 solders to the board card edge. Use your existing cables.

CPU/keyboard to expansion interface $18.95
Expansion interface to disk, printer, RS232, screen printer (specify) . . . . . .$9.95 ea
Full set, six connectors. . . $54.95

VISA · master charge

EAP COMPANY
P.O. Box 14, Keller, TX 76248
(817) 498-4242
*TRS-80 is a trademark of Tandy Corp.

↙300



NEW! for the '89 from

MAGNOLIA MICROSYSTEMS

↙234

DOUBLE DENSITY DISK CONTROLLER

for both 5¼" & 8" drives
only $595 complete
including CP/M™2.2

MAGNOLIA MICROSYSTEMS, INC.
2812 Thorndyke W., Seattle 98199
(206) 285-7266 (800) 426-2841

CP/M is a trademark of Digital Research.

VOICE SYNTHESIZER WITH INTERACTIVE TELEPHONE INTERFACE

For APPLE II™ compatible dial-up voice response and remote data-base access arrangements, consider a V100 series design from **VYNET CORPORATION.**

- Direct connect, auto-dial/answer
- Control via Touch-Tone™ detection
- Allophone (LPC) based voice synthesizer
- Includes 1,000 word vocabulary
- Editor for custom vocabulary
- Extensive application software
- Programmable buffered port
- Upgrade available for high quality LPC vocabulary
- $395.00

Telephone interface may be purchased without synthesizer. TRS-80™ and IBM versions available soon.

VYNET CORPORATION ↙158
2405 QUME DRIVE
SAN JOSE, CA 95131
(408) 942-1037

$275 DISK DRIVES

5¼" 40 Track drive with case and power supply.

FLIPPY DRIVES ONLY $295.00
2 DRIVE CABLE $14.95
4116 MEMORY CHIPS 8 FOR $20

CORSAIR COMPUTER CORPORATION
7952 Highway 80 West
Fort Worth, TX 76116 ↙346
817-244-8051

↙See List of Advertisers on page 130

up to 4808 items—a huge number.

The literature claims that IMS can do its thing rapidly, due to a "unique machine-language database," and that you'll "be assured of trouble free inventory control."

Well, almost.

Oh, the system does work, and it does what it says it'll do. Once your files are set up, they're easy to maintain and work with. The reports are fast and accurate. But, like any other noncustomized program, it has some built-in limitations. Which means the IMS system will work for you if you're willing to accept those constraints and work within them.

The biggest difficulty with IMS is that the system seems to be designed from a programmer's, rather than a businessman's, point of view.

You get your first hint when you discover that for IMS to handle so many items, it needs six disk drives. The program handles about 800 items per disk, but each disk has to be in its own drive.

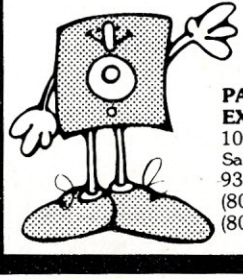
It would have made more sense to keep 800 items per disk, but make the program go from disk to disk; then it could be run using an unlimited number of items with only a single disk system. In today's market, it doesn't make economic sense to buy six disk drives (which, using DOS 3.2, would allow you about 600,000 bytes of data online), while you could buy a fixed disk system for roughly the same price with almost ten times the storage capacity!

So, count your inventory items, and be aware of the fact that using this program, you'll be limited by the number of disk drives you have.

The manual is reasonably well-written, although without an index. There's some elementary advice on handling and inserting diskettes, which is good for the first-time user.

Verbatim
flexible disks

Call Free **(800) 235-4137** for prices and information. Dealer inquiries invited. C.O.D. and charge cards accepted.



VISA

PACIFIC EXCHANGES ↙172
100 Foothill Blvd.
San Luis Obispo, CA
93401. In Cal. call
(800) 592-5935 or
(805) 543-1037.

This program keeps track of all sales from inventory, per item, for a six-month period.

They also allow you to format a disk and put sample inventory information on it. This is a great idea, and lets you work with the system using 'phoney' data, so you can't hurt it if you do something wrong. It lets you become familiar with all aspects of the system before you start with your own information.

You'll discover when running your practice sessions that when you enter information for a new item, it's automatically saved, without giving you a chance to correct the data. You can skip to a different part of the program to modify the information, of course, but it would have been easier to let you correct the data as it's put in. And once you put the part number in, you're never allowed to change it. This could be a problem if your numbering system changes sometime in the future.

I suspect the reasoning behind this programming method is to protect the stock numbers from the person using the system. But if you trust someone enough to let them change the numbers for items in stock, adjust prices and so on, you might as well trust them not to mess up the part numbers.

One helpful feature IMS provides is the capability to help you find a part, even if you only know the first part of its stock number. IMS will display (or print) all the items that start with the partial number you give it. So, if you know that the item you want to see starts with mic-, the program will list all the items that have mic- as the first part of their stock number.

You're allowed to have 21 characters for each part number, and 27 for each description. You can also use substitute part numbers (15 characters), the manufacturer's name (14) and the manufacturer's part number (14). Of these, the only one that might be a little small is the manufacturer's part number—they can get a bit longer than the 14 characters allowed.

When you add a new item to your inventory, IMS will automatically check to see if that number is in use—a good feature.

One of this program's main benefits is its ability to keep track of all sales from inventory, per item, for a six-month period. It'll display or print a consumption record for each part, so you'll not only know what is selling but when it is selling. IMS also provides an excess stock printout (excess stock is considered to be the stock on hand, less two months of normal use). You can also get a printout of what's not selling at all.

The Inventory Management System will also keep track of back orders; they can be either items you're waiting to get from a supplier, or items you still need to deliver to a customer (you can decide which definition you'll use, but you have to be consistent in its use).

But with all the reports available, you can't get a simple printout you could use for your price list—something like the part number, description and retail price. This is another thing a businessman might think of and want, but a programmer might not consider.

The other major difficulty, from a business standpoint, is that IMS does not provide for the use of purchase orders. Any business of any size uses purchase orders to not only verify their ordering, but to keep track of items. IMS does indicate that an item is on-order, and on what date it was ordered, but doesn't do a thing to tell you where you ordered it from. Most businesses have more than one supplier for everything they sell, even though one might be the primary supplier. And I know from my own experience that when I order something, I'm *positive* I'll remember who the order is for and who it was ordered from, until it doesn't show up and I have to back-track to find out what happened to it. Then I can never remember!

The manual seems to get weaker toward the end. For instance, you have to set the printer characteristics using ASCII codes. They do have a chart of the codes (without an explanation), and they do say, "This is probably the most difficult part of the system for inexperienced computer users to grasp...." But they don't do a whole lot to tell the user what he needs to do to access his printer properly. They do suggest that you consult your dealer if the printer doesn't interface with the program, but a little more explanation here would have helped.

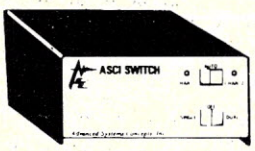
And, unfortunately, the system is not protected from a reset. If you do, says the manual, "your system will freeze, resulting in probable damage to your inventory database," and "a fatal, irrevocable error will occur." Since there are ways to reset-protect a program while it's in use, they should have been incorporated into the IMS program.

There's no doubt that Hayden's Inventory Management System will handle your inventory paperwork. It'll do it fast and with neat reports. If you can live with the restraints (and many businesses could), the system seems reasonably priced. If you can't, or you don't want to buy more disk drives as your inventory expands, then you're better off looking for a program designed more from a business standpoint.

(Hayden Book Co., 50 Essex St., Rochelle Park, NJ 07662. $175.)

Gregory R. Glau
Prescott, AZ

TIRED OF CHANGING CABLES AND TURNING KNOBS?



$195

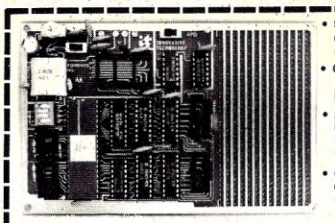
ASCI SWITCH

- Computer Controlled or Manual
- Command Code User Selectable
- Select one of two Peripherals
- Select one of two Computers
- Asynchronous to 19200 Baud
- No External Power Needed

Call or write

ADVANCED SYSTEMS CONCEPTS, INC.
P.O.BOX Q, ALTADENA, CA. 91001
(213) 684-5461 or 794-2308

✓39



- Supports the 6801 microcomputer family
- Only 4x6¼" including a 4x2" prototyping area
- 2K Bytes EPROM/2K Bytes RAM/RS-232 Interface
- Complete documentation (over 50 pages)

MC6801 APPLICATIONS PROTOTYPE BOARD

The APB is a small board which supports the MC6801 family of microcomputers. It is described in Motorola's application note AN799. A typical 6801 member contains an enhanced 6800 processor, 2K bytes of ROM, 128 bytes of RAM, a 16-bit programmable timer, parallel I/O, and a serial communications interface. In addition to the resources of the 6801, the APB provides an additional 2K bytes of EPROM (TMS2716), 2K bytes of RAM (2114L), and a full duplex RS-232 interface. It also supports special versions such as the 6801G1 with its LILbug* monitor, and provides on-board programming of the 68701 EPROM version.

The APB is an excellent **educational aid** which allows for evaluation and familiarization of 6801 family members . . . It is great for **prototype development.** Since the 'nuts and bolts' are already in place, the designer need only add the necessary interface circuits for a particular application . . . It can also be used as a simple cost-effective **dedicated controller** for those limited quantity applications.

Besides being so practical, it is a **fun** little board. Order yours today!

* TM of Motorola Semiconductor Products, Inc.

APB-1 Bare board with documentation	$ 19
APB-2 Above assembled with all parts less microcomputer and memory	$ 69
APB-3 Above with MC6801G1 and LILbug manual	$109
APB-4 Above with four 2114L RAMs	$129

For the **SS-30** Bus:
AD-68A A/D Converter - 8 channels, 8 bit, 0-2.5V input, 6ms conversion time — $39 A&T
CI-68A Control Interface - 8 opto-isolated inputs, 8 reed relay outputs — $79 kit, $98 A&T

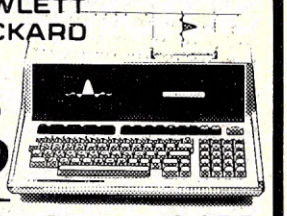
Terms: Check, MO, VISA, or MC. In US and Canada add $3 per item for shipping. Others add $7 per item. US funds only. TX add 5% tax. Shipped from stock to two weeks.

INNOVATIVE TECHNOLOGY
510 Oxford Park ✓128
Garland, TX 75043 (214) 270-8393

We Beat All Prices !

HEWLETT PACKARD

HP-85 or **HP-125** CP/M* based.



$1989 Your Choice

NEW HP-87. . . . CALL

5¼" Dual Master Disk Drive	CALL
8" Dual Master Disk Drive	CALL
5meg WINCHESTER Hard Disk	$3599
5meg WIN. w/5¼ DSDD floppy	$4399
APPLE II PLUS, 48K	CALL
APPLE III	CALL
TI 99/4	$367
COMMODORE VIC-20	$255
NEC PC-8001-A, 32K	$989
XEROX 820 5¼" Disk Drives	$2489
XEROX 820 8" Disk Drives	$3095

TI CALCULATORS

TIP-55-II	$36
TIP-Business Analysis II	$36
TIP-58C	$79
TIP-59	$169
TIP-P-100C	$149

HP-41CV *w/Five times more memory* **Built In** List, $325

$244

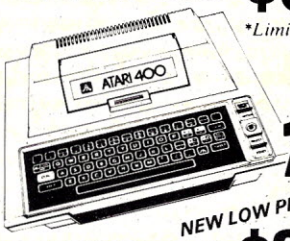
NOW IN STOCK

$189 HP-41C list, $250

HP-41CV Printer	$289.00
HP-41CV Quad Memory	$83.95
HP-41CV CardReader	$167.95
HP82160A HP-IL Module	$99.00
HP82161A Digital Cassette Drive	$449.00

ATARI® 800 $689

*Limited time only



ATARI

NEW LOW PRICE

ATARI 400 $339

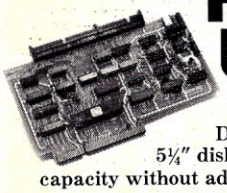
Atari 830 Acoustic Modem	$145
Atari 825 80 Col. Impt. Ptr.	$565
Atari 410 Prog. Recorder	$69
Atari 810 Disk Drive	$419

Personal Computer Systems
P.O. Box 1073
Syracuse, N.Y. 13201
(315) 478-6800 ✓303

Prices do not include shipping bt UPS. All prices and offers are subject to change without notice

---

ZENITH/ Heath Users



Double Your 5¼" disk storage capacity without adding a drive.

Get twice as much from your H88 or H89 microcomputer. Our FDC-880H floppy disk controller, in conjunction with your 5¼" drives, for example, expands memory capacity from 256 bytes to 512 bytes per sector.

And it handles single and double-sided, single and double-density, 8" and 5¼" drives — simultaneously.

Call 714/275-1272 today or write for details.

C.D.R. Systems Inc.

Controlled Data Recording Systems, Inc.
7667 Vickers St., San Diego, CA 92111

✓148

YOUR OTHER RIGHT HAND

820

For Only

$2249

Call or write for prices on:

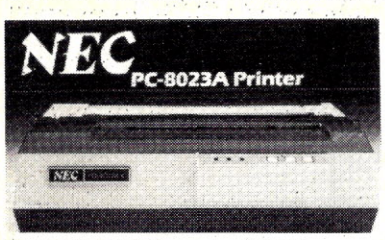
ZENITH	**S-100**	**OKIDATA (82A $525)**
CORVUS	**Diskettes**	**Software**

All items factory sealed cartons with full factory warranty. Add shipping and handling. VISA, Cleared Check OK, C.O.D. requires a deposit.

Prices are low and subject to change without notice. All items subject to availability.

IBComputers ✓235
10980 S.W. Muirwood Drive
Portland, Oregon 97225
503/644/2914

XEROX® and 820 are trademarks of XEROX CORPORATION



NEC PC-8023A . . . $499.88 DELIVERED

The NEC 8023A matrix printer outperforms every printer in its price range—and then some. Numerous software-accesible fonts for versatility, legibility, variety, contrast, and emphasis. Crisp, clear, clean dot matrix impressions on your choice of friction-fed or pin-fed paper. Standard Centronics-type parallel interface.

- High-resolution graphics
- Proportional spacing
- 8 character sizes
- 5 unique alphabets
- 100 CPS print speed
- Bidirectional, Logic Seeking
- Friction feed/adjustable tractors
- Bidirectional paper feed
- Subscript, Superscript, &underlining
- Single sheet friction feed

HIGH TECHNOLOGY AT AFFORDABLE PRICES

THE BOTTOM LINE ✓87

Orders & Information (603)-673-8857
Orders Only (800)-343-0726

12 Johnson Street, Milford NH 03055

SAVE 90%

YES you can save up to 90% on a computer system of your own

$150.00 buys a 4MHz Z80A with 64KB & a real Front Panel

$200.00 buys a Full Function 24x80 CRT with Keyboard

You can have your own computer and be running Fortran, Basic, Pascal, etc. IF you get our

FREE BROCHURE TODAY!

DIGATEK CORPORATION ✓155
Suite 77
2723 West Butler Drive
Phoenix AZ 85021

ROLL-YOUR-OWN-TECHNOLOGY AND SAVE A BUNDLE

✓See List of Advertisers on page 130

Simplifying Graphics on the Apple
Ingenious Documentation Aid
Chess Challenge on the Heath
Self-Diagnosis on CP/M
Taking Stock of Your Business

Ampergraph

A utility from Madwest Lets your Apple Produce ample graphics

The graphics of the Apple II are excellent—even their competitors admit this. But the graphics routines that come with the machine are tedious to use.

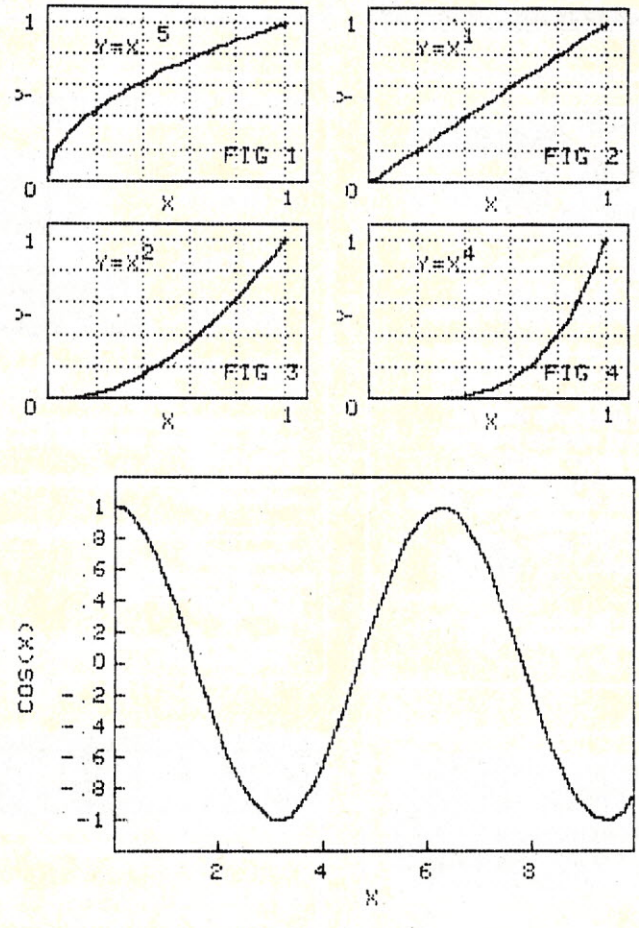
Many suppliers have recognized this weakness, and have produced various kinds of specialized programs to simplify specific graphics applications. One such supplier is Madwest Software.

Madwest Software has produced Ampergraph, a utility to draw graphs on the Apple II. Essentially, it adds 20 commands to Applesoft Basic. These commands simplify the job of drawing graphs, either on the CRT or on a printer—provided you have a Silentype printer, or are skillful enough with machine-language programming to find and modify Ampergraph's machine-language print routine.

Since Ampergraph uses commands embedded in an ordinary Applesoft Basic program, it is fairly easy to use. It can graph from mathematical formulae, or from numbers stored in DATA statements, or, for that matter, from both. You simply specify a series of x,y coordinates through an & DRAW command (ordinarily in a FOR I = n1 to n2 loop), and your Applesoft program does the rest.

You do have to specify scale values for the X and Y axes; but you can also label both the axes and the lines, draw several graphs on one page, draw one graph on just one part of the page, insert a grid on the graph, and insert "error bars" (helpful in statistical uses, for example, where it might be useful to show the standard deviation).

Ampergraph is specifically designed for line graphs, but it can also be used to draw bar graphs, though the procedure is awkward (you must draw the line up from the x axis, then horizontally, and finally back down to the x axis). Ampergraph could also draw pie graphs, or for that matter pictures which are not graphs; but for these applications, you're about as well off with the regular Apple II graphics.



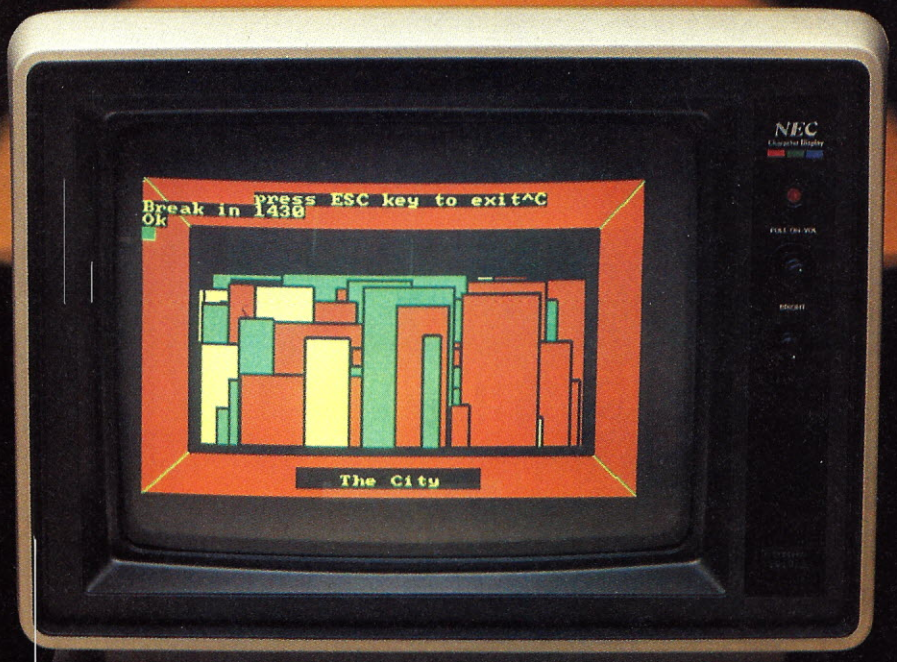
This example demonstrates two features of Ampergraph: its ability to create grid lines and its ability to draw more than one graph at a time. It also illustrates, for the serious mathematician, one potential weakness of the Ampergraph utility—the x and y axes are not drawn on the same scale. This, of course, distorts the curves in an absolute sense, although the relative relationships of the curves are retained. The example is a modification (by the author) of the one on page 11 of the user's manual.

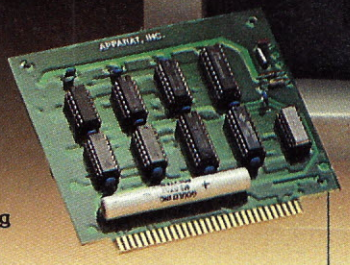
This example is taken from the Ampergraph user's manual, page 8. It shows a plot of the cosine of x, with x being the horizontal axis and y being the vertical axis. Notice that the label "COS(X)" is positioned vertically rather than horizontally.

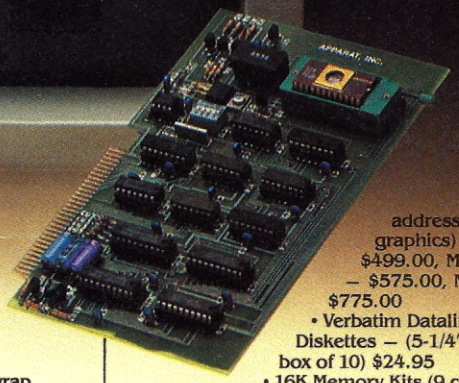
The Ampergraph user's manual is almost adequate. Programmers who have

(continued on page 151)

Look What Apparat has for your IBM Personal Computer.







The following add-ons are available immediately:

- 2 Dual Headed 40 Track Drives – (appears as four) 640K of storage, software patch, easy internal mount. $630.00
- Combo Card – Parallel printer, ASYNC communication (RS-232), and clock calendar functions, uses only one slot. $279.00
- 2 Single Headed 40 Track Drives – 320K of disk storage, easy internal mount. $450.00
- 48K additional RAM – 27 chips plug into master PC board $75.00
- Add-on Memory Card – (uses 64K dynamic RAM chips), 64K – $425.00, 128K – $525.00, 192K – $625.00, 256K – $725.00
- Prom Blaster – Programs most 1K to 4K EPROMS of 25XX and 27XX single or multivoltage, personality modules, read/write software. $149.00
- Apparat Game Diskette – $24.95
- Clock Calendar – Features seconds, minutes, hours, day of week, date, month and year, backup battery, leap year and crystal time base. $129.00
- Prototype Card – 3.5 by 8 inch wirewrap holds 150-14 pin dips. $29.95
- RGB Color Monitors – Includes cable, 16 color modifications, NEC – $1,095.00, AMDEK – $899.00, TECO – $699.00.
- 3rd and 4th Add-on Drives – Expansion cabinet and IBM compatible drives, cabinet and 1 drive – $499.00, two drives – $749.00
- 64K Hardware Print-Spooler – Parallel printer adapter, buffers 13 minutes of output at 80 characters/second. $399.00.
- EPSON MX Printers – MX-80 (with dot addressable graphics) – $499.00, MX-80 F/T – $575.00, MX-100 – $775.00
- Verbatim Datalife Diskettes – (5-1/4" 40 track, box of 10) $24.95
- 16K Memory Kits (9 chips) – $25.00
- 5-1/4" Flip-Sort – $21.95
- 5-1/4" Plastic Library Case – $1.95

Apparat will continue to develop add-on products for your IBM Personal Computer. Call today for more information. Dealer inquiries welcome.

(303) 741-1778

IBM Personal Computer is a trademark of IBM.

VISA MasterCard

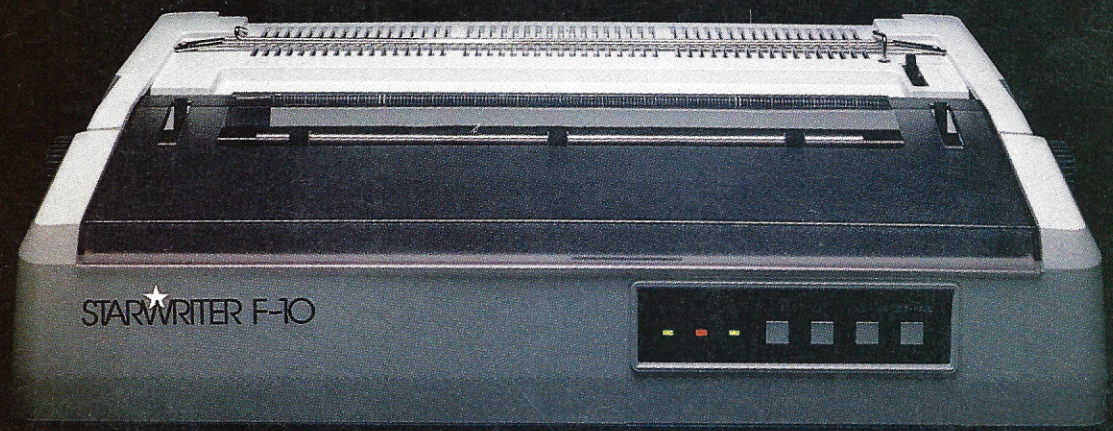
Apparat, Inc.

192

4401 So. Tamarac Parkway, Denver, CO 80237 (303) 741-1778

"ON GOING SUPPORT FOR MICROCOMPUTERS"

SAVE 6 INCHES, 10 POUNDS, AND $800.



On the new, slicked-up, trimmed-down Starwriter F-10.

It's C. Itoh's latest generation of letter-quality printers.

It cranks out flawless copy at 40 cps; and its full 15" carriage lets it double in brass for both letter processing and business applications. You can plug it into almost any micro on the market (serial or parallel) simply by plugging it in. And then make it keep on trucking with inexpensive, easily available Diablo compatible daisy wheels and ribbons.

In its serial mode, it can print just about anything (including boldface, underlines, subscripts and superscripts), and snap the carriage back to start the next line in less than a second. In its line mode, it prints in both directions, for even faster throughput.

(While making about as much noise as a cat walking on Kleenex.)

It's a nice, portable 30 pounds—about 10 pounds lighter than the Starwriters before it. And it stands exactly as tall (or precisely as small) as a dollar bill.

Speaking of which:

Incredibly, the Starwriter F-10 sells for about the same preposterously low price as its predecessors. Which is to say, about $800 less than a lot of other printers that don't even come close to measuring up. Or even better...

Measuring down.

Distributed Exclusively by Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021. Call: toll-free 1-800-343-6833; or in Massachusetts call collect (617) 828-8150. Telex 951-624.

LEADING EDGE.™